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Encyclopedia of psychology

ENCYCLOPEDIA OF PSYCHOLOGY

Volume 2

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ENCYCLOPEDIA OF PSYCHOLOGY

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ENCYCLOPEDIA OF PSYCHOLOGY

Volume Two

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MAIN ABBREVIATIONS USED IN THIS WORK

AA	= Achievement age	<i>et seq.</i>	= <i>et sequens, sequentia</i> = and the following
abb.	= abbreviation	ex., exs	= example(s)
ACh	= Acetylcholine	f., ff.	= and the following
ACTH	= Adrenocorticotrophic hormone	FFF	= Flicker-fusion frequency
AL	= Adaptation level	fig., figs	= figure(s)
Am.	= American	fn.	= footnote
ANS	= Autonomic nervous system	Fre.	= French
ant.	= antonym	GABA	= Gamma-amino-butyric acid
anthropol.	= anthropological	GAS	= General adaptation syndrome
A.P.A.	= American Psychological Association	Ger.	= German
AQ	= Achievement quotient	Gr.	= Greek
b.	= born	GSR	= Galvanic skin response
biol.	= biological	Hz.	= Hertzian wave
CA	= Chronological age	Ib.	= <i>ibidem</i> = in the same place
c.	= <i>circa</i> = about	Id.	= <i>idem</i> = the same person(s)
cc	= cubic centimeter (centimetre)	i.e.	= <i>id est</i> = that is
cf.	= <i>confer</i> = compare	introd.	= introduction by
ch., chs	= chapter(s)	IQ	= Intelligence quotient
CFF	= Critical flicker frequency	IRM	= Innate releasing mechanism
chem.	= chemical	It.	= Italian
CNS	= Central nervous system	IU	= Interval of uncertainty
cps	= cycles per second	j.n.d.	= Just-noticeable difference
CR	= Conditioned response	Lat.	= Latin
CS	= conditioned stimulus	<i>loc. cit.</i>	= <i>loco citato</i> = in the place (passage) cited
d.	= died	m.	= meter (metre)
db	= decibel	MA	= Mental age
d.f.	= degrees of freedom	math.	= mathematical
DNA	= Desoxyribonucleic acid	med.	= medical
E., Es	= Experimenter(s)	min.	= minute
EA	= Educational age	mm.	= millimeter (millimetre)
Ed., Eds	= Editor(s)	n.d.	= no date
<i>ed. cit.</i>	= edition cited	No., Nos	= number(s)
EEG	= Electroencephalogram	n.p.	= no place of publication
e.g.	= <i>exempli gratia</i> = for example	n.s.	= new series
EKG	= Electrocardiogram	NS	= Nervous system
Eng.	= English	O	= Observer
EQ	= Educational quotient	<i>op. cit.</i>	= <i>opere citato</i> = in the work cited
ERG	= Electroretinogram	o.s.	= old series
esp.	= especially	OT	= Occupational therapy
ESP	= Extrasensory perception	p	= probability
<i>et al.</i>	= <i>et alii</i> = and others	p., pp.	= page(s)
etc.	= <i>et cetera</i> = and so forth		

PE	= Probable error	SD	= Standard deviation
philol.	= philological	SE	= Standard error
philos.	= philosophical	sec.	= second(s)
phys.	= physical	sect.	= section
physiol.	= physiological	ser.	= series
PR	= Percentile rank	S-R	= Stimulus-response
pref.	= preface	stat.	= statistical
q.v.	= <i>quod vide</i> = which see	syn.	= synonym
R	= Response	TAT	= Thematic Apperception Test
REM	= Rapid eye movement	TE	= Trial-and-error learning
resp.	= respectively	trans.	= translation
rev.	= revised by	UR	= Unconditioned response
RI	= Retroactive inhibition	US	= Unconditioned stimulus
RNA	= Ribonucleic acid	V	= volt
rpm	= revolutions per minute	vol.	= volume
RS	= Reinforcing stimulus	VTE	= Vicarious trial and error
RT	= Reaction time	WHO	= World Health Organization
S	= Stimulus		
S., Ss	= Subject(s)		

G

GABA. See *Gamma-amino-butyric acid*.

Gait. Modes of walking in human and animal locomotion considered from the anatomical and physiological viewpoints. Klemm's work (²1954) on the rhythm and gestalt characteristics of gait is particularly well-known to psychologists. Kietz's studies (²1966) are especially important for the expressive psychological aspects of gait (see *Expression*). Smieskol (1968) summarizes more than 700 publications on the subject.

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Gallup, George Horace. B. 18/11/1901 in Jefferson (Iowa). Founder of the modern opinion poll. Lecturer at the University of Iowa from 1923 to 1929. Appointed professor of journalism at Drake University in 1929 and at the Northwestern University in 1931. He was Director of research in the Young and Rubicam Advertising Agency between 1932 and 1947, and Professor at the Pulitzer School of Journalism at Columbia University from 1935–37. In 1935, Gallup founded the American Institute of Public Opinion in Princeton—the first institute ever to conduct public opinion polls. He gained immediate fame in 1936 by forecasting Roosevelt's victory in the American presidential elections

with an error of only 6 per cent. In the same year he also founded the British Institute of Public Opinion. He has been Editor of *The Public Opinion Quarterly* since 1936. W.W.

Gallup poll. A social survey or method of measuring public opinion developed by G. H. Gallup in the United States. Data are gathered by systematic sampling; an attempt is made to obtain representative results by means of personal interviews. The general validity of the method has remained unquestioned since 1936.

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Galton, Sir Francis. *Life and work* (other than psychological): B. 16/2/1822 in Birmingham (England); d. 17/1/1911 in London. Galton was a half-cousin of Darwin and is considered by many authors to have been a genius. His IQ has been estimated at 200. His psychological studies were not systematic but extremely varied and significant. After medical training at the Birmingham General Hospital and medical studies at King's College, London, he turned to mathematics, graduating from Trinity College, Cambridge. He spent most of the next ten years up to 1855 on research in South-West and North Africa, publishing a number of reports (*Art of*

Travel, 1855, etc.) for which he was awarded the Medal of the Royal Geographic Society. He then worked on meteorology, and published the first weather maps; he discovered the anticyclone, etc.

Psychological work: Impressed by Darwin's *Origin of Species*, Galton devoted increasing attention from 1860 onwards to anthropological and psychological problems. His studies were far-ranging, including research into various areas of sense phenomena, mental imagery, the origin and measurement of thought associations, free will, studies of the phenomenon of ability and its inheritance (with particular reference to genius). Galton's major contribution to psychology was in the area of methodology. He is generally considered to have founded the psychometric school of psychology. He invented the first psychological test methods for the measurement of intelligence and ability. These were primarily based on sensory discrimination and were prepared by comparing extreme groups, i.e. highly-gifted and mentally-defective individuals. He founded the first test laboratory in London (in 1882) at which visitors could take a battery of psychological tests on a fee-paying basis.

In his studies of visual imagery, Galton was one of the first authors to use questionnaires in order to study psychological characteristics. He also invented the word association test, which was later taken over by W. Wundt; and he is taken to be the founder of twin studies.

Galton originally believed that psychological traits could be inherited like physiological characteristics. He conducted a number of tests (mainly on public figures) to confirm his assumption; he tried in particular to determine the frequency of outstanding individuals among the ancestors, descendants and relatives of his subjects. Galton made a significant contribution to the development of differential psychology by suggesting—and thus opposing contemporary theories—that human characteristics are extremely varied, so that it is of value to psychologists

to study the extent and causes of individual differences.

In statistics, Galton made an important contribution by developing and applying the correlation method. At his suggestion, his pupil, Pearson, later continued his work in this area and developed the product-moment correlation (q.v.) method. Galton founded the first journal of scientific statistics (*Biometrika*). His application of the normal distribution curve (q.v.) to psychological data was a major contribution to the development of psychological methodology. On the basis of his practical studies he concluded that psychological and physiological characteristics follow a standard distribution pattern throughout the population.

Major works: The telotype: a printing electric telegraph, 1850. The art of travel, or shifts and contrivances available in wild countries, 1872. Meteorographica, or methods of mapping the weather, 1863. Hereditary genius: an enquiry into its laws and consequences, 1869. English men of science: their nature and nurture, 1874. Address to the anthropological department of the British Association, 1878. Generic images: with autotype illustrations, 1879. Psychometric experiments, *Brain*, 1879, 2, 149–62. Inquiries into human faculty and its development, 1883. Record of family faculties, 1884. Measurement of character, *Fortnightly Review*, 1884, 36, 179–85. Co-relations and their measurement, chiefly from anthropometric data. *Proc. Roy. Soc.*, 1888, 15, 135–45. Natural inheritance, 1889. Finger-prints, 1892. Finger-print directories, 1895. Index to achievements of near kinsmen of some of the fellows of the Royal Society, 1904. Eugenics: its definition, scope and aims, 1905. **Bibliography:** Burt, C.: Francis Galton and his contributions to psychology. *Brit. J. Stat. Psychol.*, 1962, 15. Galton, F.: *Memories of my life*. London, 1908. Pearson, K.: *The life, letters and labours of Francis Galton*, Vols 1–4. London, 1914–30. *W.W.*

Galvanic skin response (abb. GSR; syn. *Electrodermal response*; *Psychogalvanic*

reflex). The skin activity triggered by a sensory stimulus or motor reaction (coughing, sneezing) can be measured (a) as a short (0.5 to 3.5 seconds) amplification of a direct current passed through the skin (exosomatic galvanic skin reflex) due to a reduction in the basal polarization resistance; or (b) as a temporary, primarily negative fluctuation in the potential which can be directly derived from the skin (endosomatic galvanic skin reaction).

These electrical processes on the skin start essentially (negative deflection) as changes brought about by differing adsorption of oppositely charged ions on the surface of membranes, or by varying permeation through the membrane into the epidermal layer (in particular the *stratum lucidum*). After a certain latency, a further potential change (positive deflection) is superimposed because of depolarization of the sweat gland membrane, further amplified by incipient secretion and short-term contraction of the sweat gland passages. The epidermal cells and sweat glands may be innervated by separate sympathetic fibers; this would suggest that the galvanic skin response is a phenomenon accompanying first of all a change in the efficiency of somatosensitive receptors, and secondly an increase in the motor grasping and holding activities. In psychophysics (q.v.) the galvanic skin response based on stimuli actuated primarily in subcortical, vegetative centers is a useful measurement method, e.g. for habituation processes, conditioning, vegetative excitability, etc. Good correlation with intensity parameters for sensory stimuli is also reported.

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Wilcott, R. C.: The partial independence of skin potential and skin resistance from sweating. *Psychophysiology*, 1964, 1, 55. M.S.

Gametes. Haploid sex cells which combine to form a diploid zygote representing a new individual (unicellular), or from which a new individual may develop (multicellular), which then shows a new combination of characteristics inherited from the parents (gamonts). If the two combining gametes are externally identical the process is *isogamy*; if they differ in size, *anisogamy*; and if the female gamete (then known as the ovum) is not capable of autonomous movement and is much larger than the mobile male gamete, *oogamy*. H.S.

Game theory. A mathematical theory which serves as a model for decision-making behavior, in so far as the result of the behavior is always determined by several decision units (individuals, groups, societies, and so on).

A "game" occurs if the decisions (or results of decisions) of at least two organisms result in a consequence for each participant, which for at least one of those concerned is not independent of the behavior of at least one of the others. The numerical values of the consequences are known as "payoffs". Since those games in particular are taken into consideration in which an increased payoff for one participant is linked to a decreased payoff for an opponent, the theory can also serve as a model for certain social conflicts (see *Conflict*).

Bibliography: Shubik, M.: (Ed.): *Game theory and related approaches to social behavior*. New York London, 1964. W.H.T.

Gamma-amino-butyric acid (γ -aminobutyric acid; abb. GABA). A biogenic amine (q.v.) first detected in the brain in 1950; it is produced from glutamic acid (q.v.) by biosynthesis. The biological role of GABA has not

yet been determined; neurophysiological experiments on animals do, however, show that it is a significant factor in inhibiting cortical transmission.

Bibliography: Curtis, D. R. & Watkins, J. C.: The pharmacology of amino acids related to gamma-amino-butyric acids. *Pharmacol. Rev.*, 1965, 17, 347-91. W.J.

Gamma movement. An apparent movement (q.v.) of expansion and contraction which occurs if the intensity of illumination of a single figure in a dark surrounding area is suddenly increased or reduced. See *Irradiation*. W.P.

Ganglion. Ganglia form a collection of nerve cells (see *Ganglionic cells*) in the form of a circular, oval or irregular structure with a length of one or more millimeters. With the exception of the basal ganglia (q.v.), the ganglia are located outside the central nervous system. The spinal ganglia in the intervertebral foramina consist mainly of pseudo-unipolar ganglionic cells, and constitute the cell body of the primary, efferent neurons. The ganglia of the autonomic nervous system (q.v.) are located in the head, sympathetic nerves, and abdominal and pelvic region. In surgery the term "ganglion" is used to describe a cystic tumor of the joint membranes or tendon sheaths. G.A.

Ganglionic blocking agents. Substances which block the transmission of impulses in the synapses of the autonomic ganglia primarily by reaction with acetylcholine receptors. This results in a reduction of blood pressure and diminished tonicity of the smooth musculature. Ganglionic blocking agents are antagonists of nicotine (q.v.), which is a ganglionic stimulant.

Bibliography: Volle, R. L. & Koelle, G. B.: Ganglionic stimulating and blocking agents. In: Goodman, L. S. & Gilman, A.: The pharmacological basis of therapeutics. New York, 1965. G.D.

Ganglionic cells. Cells (nerve cells, neurocytes, gangliocytes, neurones) which consist of the cell body (perikaryon), the cell nucleus, and one or more extensions in the form of dendrites—which consist, like the cell body, of cytoplasm and have a receptive function, together with neurites (q.v.) which act as effectors and transmitters. A distinction is made between unipolar, pseudo-unipolar, bipolar and multipolar ganglionic cells on the basis of the configuration of the extensions. There are between 14 and 16 thousand million ganglionic cells in the human nervous system. The ganglionic cells are connected together by synapses (q.v.).

Bibliography: Porter, K. R. & Bonneville, M. A.: An introduction to the fine structure of cells and tissues. Philadelphia, 1964. G.A.

Ganser syndrome. Otherwise known as the "syndrome of approximate answers", this was originally described by S. J. M. Ganser. It occurs characteristically in prisoners who give silly approximate answers to questions in order to feign mental illness. An inconsistent lay impression of mental illness is presented. May be viewed as malingering or hysteria. A similar picture sometimes occurs in schizophrenia or after head injury. D.E.

Ganzheit; gestalt; structure. Some confusion surrounds the use of these three terms. Many authors use them as synonyms. Definitions and explanatory comments in dictionaries are also broadly similar. We shall try to distinguish between the notions on the basis of fundamental texts and suggest how they should be used in future. A more rigid distinction will be made between their substantive and attributive use than has been the case in the past.

1. *Ganzheit* (whole, wholeness, completeness, entity) is derived from the notion of "das Ganze" (or "the whole"), and was introduced into psychology by F. Krueger. A totality as a function of space, time or both space and time (a complex) is referred to

as "*ein Ganzes*" or "a whole" if the type, location and arrangement of the "components" are not accidental or random (as they are in an aggregate), i.e. if the totality *has a structure*, and provided that there is a real relationship between the component factors. This totality is the combination of all its parts and only exists as a "whole" (i.e. is "*ganzheitlich*") if none of these parts is lacking and if the relationship between them (as well as the distinction between this interaction and the environment) is not interrupted anywhere; this last point is generally overlooked in the literature.

A whole is only "holistic", or possesses "wholeness", if it satisfies an additional condition, which is best formulated in the following proposition of Wertheimer's (1925): "There are relationships in which all that occurs in the whole is not dependent on the nature and combination of the individual parts, but on the contrary . . . where that which occurs in a part of the whole is determined by inner structural laws of this whole". Objects which have this holistic, total character tend also to possess features which cannot be detected in any of their isolated parts (holistic or total characteristics, or complex qualities, e.g. the expression of a face). To this extent, wholes are also "super-summative".

Such phenomena can only be understood by holistic (*molar*) observation, as opposed to the atomistic (*molecular*) approach proper to non-holistic phenomena. What is the difference between these two modes of observation? In examining an object which is not holistic in the sense defined above, the "analysis" may be based on a factual ("objective") separation of individual parts from the whole, since it is justifiable to assume that these parts will behave in the same way in isolation as they do in their appropriate location in the total unit. In the holistic approach, analysis consists of an investigation of the individual parts and component processes as they are located in the whole, and with regard to their function in the whole. Behavior in isolation cannot be expected to coincide with the

behavior in the whole; in addition, it is probable that local phenomena or processes will be affected both by local factors and by extralocal or translocal factors. Finally, if parts or loci are isolated or separated out, it is probable that information which is essential to the whole will be overlooked or disappear. Comparison of reactions under different conditions may of course afford valuable information; an investigation based on atomistic procedures may therefore also be of heuristic value for the study of a "whole", provided that it is carried out alongside the strictly holistic analysis.

In addition to living and animate beings whose holistic nature is immediately apparent, at least the field phenomena of the inanimate environment also require a holistic approach (Köhler, 1918). A philosophical attitude or world view in which the central notion is the fact of "wholeness" is known as "holism" (Smuts, 1926). Those personality theories which, by contrast with the idea of a multiplicity of more or less independent "factors", stress the unity of the personality and in which groups or communities are considered as supra-individual and real unities or real wholes, and individuals as "we-factors", are also known as holistic. This applies, e.g., to the "individual psychology" founded by Adler (1907).

The holistic psychological theories, in particular those of the Leipzig School (q.v.) and that of Werner (1953), assume a genetic primacy of the non- or insignificantly structured (complex, diffuse, continuous) whole over its structured (differentiated) realizations; this applies both to behavior and individual experience. The unorganized primary forms are defined as "whole" in a narrower, "more specific" sense. Their (affective) holistic characteristics are distinguished, as "complex qualities", from the "gestalt qualities" of sharply defined and (generally) organized, or structured, wholes. It is difficult to make a distinction between the two, and it does not seem fundamentally important to do so.

2. *Structure (Struktur)*. This term originally denoted a *characteristic* of a whole, i.e. its composition, the arrangement of its parts or elements including the orderly totality of the relations between them. The word is also used with this meaning in other sciences: in chemistry, mineralogy or anatomy one may speak of the structure of a molecule, crystal or bone. W. Dilthey, who introduced the notion of structure into psychology, clearly uses it in this attributive sense when he says it is the "arrangement by which psychological facts of differing composition are connected together in the developed mental life by an internal relationship which can be experienced". In the earlier quotation, Wertheimer used the concept to describe the construction of unities of experience and action. Spranger uses it to denote the complex of interests of an individual, while L. Klages, P. Lersch and Wellek speak of the "structure of the person". See *Strata theory*.

Two special meanings have developed in psychology, of which the second at least is objective: (a) in the American expression "structuralism" signifying, e.g. for E. B. Titchener, the totality of the (statically apprehended) contents of consciousness as opposed to the conditional behavioral relationships considered by the *functionalists*; (b) in the terminology of the Leipzig School holistic theory. A distinction is made here between two sub-concepts of the general notion of wholeness: "experiential wholes" and "structures". According to Krueger, these are the relatively permanent *premises for the possibility of developing experiential wholes*. They form the basis of psychic functions, and are essentially "beyond consciousness", or transphenomenal, i.e. intervening variables or constructs in E. C. Tolman's terminology, but also in certain "profound individual experiences" (feelings and value judgments) only rarely accessible to direct experience. Strictly speaking, they do not exist "in themselves" or "as such" but only to the extent that they are effectively expressed in psychic phenomena (individual

experiences) (Wellek, 1941). This suggests that what occurs is a hypostatization in the sense of the Platonic "idea" and the neo-vitalist "entelechy".

3. *Gestalt* (form, configuration). The gestalt concept is a further refinement of the notion of wholeness, which proved useful initially in perception theory, and was then more generally applied, and has tended to come increasingly to the fore in connection with the problem of the order obtaining within the whole.

(a) *First stage*. It has been known since classical antiquity that the specific character of the whole can be changed decisively by slight local interventions (removal, addition, alteration, displacement). In 1890, von Ehrenfels added the new notion that when changes occur which affect all the parts of a whole (exchange of material, movement to other sensory or existential areas), the specific character of this whole is maintained if its structure (i.e. the dimensional and positional relationships between the parts; and, in particular, their functions, in the case of behavioral wholes) is retained. Von Ehrenfels referred to wholes which possessed this characteristic as "gestalts" (*Gestalten*), to their supersummative property as "gestalt quality", and to the change which takes place without affecting that quality as "transposability".

(b) *Second stage* (Wertheimer, 1912). The whole is not, as von Ehrenfels supposed, the sum of the parts plus the holistic characteristic: $W = \sum p + h$, but $W = f(\sum p, c, l, m, n \dots)$, in which the letters following p stand for, e.g., constitution or disposition, level of development, previous history, expectation, mode of apprehension. In other words, the whole is something other than the sum of its parts. (Example: stimulus a + stimulus b at adjacent points but at a short interval of time do not result in "sensation" A + "sensation" B + movement, but in a "sensation" which moves from position A to position B). In the marginal case, e.g. in visual perception, the dynamic interaction

between part-stimuli determines whether and where a whole ends and whether it possesses parts, and what parts these are.

(c) *Third stage.* In addition to the specific characteristics of wholes, there are also specific characteristics of parts. These are characteristics which distinguish a phenomenon as the "part" of a whole from its given mode of existence as an "individual content": the function or "role" of the part in the whole (Köhler, 1918; Wertheimer, 1933).

(d) *Fourth stage.* Because of the dynamic interaction between the part processes, the assumption of a one to one correspondence between the locus of the stimulus and type of stimulus on the one hand, and the locus and type of phenomenon on the other has to be abandoned (the assumption of "constancy") (Köhler, 1913).

(e) *Fifth stage.* The structures which are most likely to develop because of this dynamic procedure are characterized by orderliness (regularity and simplicity), i.e. there is a tendency to pregnancy (*Prägnanz*), i.e. to form a "good gestalt". This is not only decisive in spontaneous field formation and three-dimensional distribution in the visual modality (Kopfermann, 1930; Metzger, 1935), but also leads under certain specific conditions to disparities between perceptive and objective form and quality (illusions).

(f) *Sixth stage.* Order can in principle be produced and maintained in two different ways. In addition to mechanical maintenance (the sole form recognized previously) of the order of states and processes through the strengthening of a material or wall ("canalization"), it is also possible to establish order by the interaction of certain part processes, i.e. there is an order which has a "dynamic" foundation. This dynamic order brought about by the interaction of inner forces, differs from mechanical order in various respects: the same forces (i) bring the order into being, (ii) maintain it, (iii) re-establish it (within certain limits) when a disturbing factor is encountered, and (iv) restructure it under certain conditions (as a

correction), e.g. in productive processes. The states of equilibrium which are finally reached also have a distinctly formal nature. The assumption of supporting factors (analogously to the postulate of entelechy) therefore becomes superfluous.

Mechanical and dynamic forms of order are not mutually exclusive; between the two extreme cases of purely dynamic and purely mechanical order, there is a continuous series of possibilities for different involvement of the two principles. The mechanical factor, e.g. in visual perception, consists (i), generally, of the anatomical structure of the receptors and conduction system, and (ii), specifically, of the instantaneous spatio-temporal configuration of stimuli. The extreme case of minimum dynamic maintenance of order, in which the event retroacts upon itself at one point at least, is cybernetic automation.

(g) *Seventh stage.* A high degree of automatic dynamic control can be assumed for all the part areas of the psyche. This holds good also for living beings as "open systems" (L. von Bertalanffy), and for the different kinds of force fields in physics (Köhler, 1924). It is therefore possible to assume an "isomorphy" of mental and the associated physiological (psychophysical) processes. A "gestalt theory" is a psychological method which makes this possibility a psychophysical working hypothesis (Köhler, 1925).

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zweidimensionaler Darstellung körperlicher Gebilde. Psychol. Forsch. 1930, 13. Krueger, F.: Der Struktur-begriff in der Psychologie. Ber. VIII Kong. exp. Psychol. Leipzig & Jena, 1924. Id.: Zur Philosophie und Psychol. der Ganzheit. Berlin, 1953. Metzger, W.: Tiefenerscheinungen in optischen Bewegungsfeldern, Psychol. Forsch. 1935, 2. Petermann, B.: The gestalt theory. London & New York, 1932. Popper, K. R.: The poverty of historicism. London, 1960, 76–93. Rausch, E.: Über Summativität und Nicht-summativität, Psychol. Forsch., 1937, 21. Sander, F. & Volkelt, H.: Ganzheitspsychologie. Munich, 1962. Smuts, J. C.: Holism and evolution. London, 1926. Wellek, A.: Das Problem des seelischen Seins. Leipzig, 1941. Werner, H.: Einführung in die Entwicklungspsychologie. Munich, 1953. Wertheimer, M.: Experimentelle Studien über das Sehen von Bewegung. Z. Psychol. 1912, 61, 161–265. Id.: Über Schlussprozesse im produktiven Denken. Berlin, 1920 (Productive thinking. New York, 1959). Id.: Untersuchungen zur Lehre der Gestalt, I. Psychol. Forsch., 1922, 1; II. Psychol. Forsch. 1923, 4. (Part trans.: Beardsall, D. C. & Wertheimer, M. (Eds): Readings in perception. Princeton, 1958, 115–35.) Id.: Drei Abhandlungen zur Gestalttheorie. Erlangen, 1925. Id.: Zum Problem der Unterscheidung von Einzelinhalt und Teil. Z. Psychol., 1933, 129. Id.: On gestalt theory. Soc. Res., 1944, 11, 78–99. Witte, W.: Zur Geschichte des psychol. Ganzheits- und Gestaltbegriffes. Stud. Gen., 1952. W. Metzger

Gargoylism. A genetic disturbance of the metabolism. Metabolic products (mucopolysaccharide) are deposited in the brain and many other organs, whose development is thus impaired. Disproportionate stunted growth with contorted facial features (hence “gargoyle”) and organic disorders. Generally accompanied by mental deficiency. C.S.

GAS (*General anxiety scale*). See *Manifest anxiety scale* (MAS).

Gastrula. In multicellular animals the blastula—a hollow sphere with a wall formed by a single cell layer—generally develops first from the fertilized ovum by cell division. The double-layered gastrula is then formed from this hollow sphere by invagination. The point of invagination remains as an opening.

H.Sch.

Gaussian curve (syn. *Gauss's curve*; *Normal [probability] curve*). A graphic representation of a symmetrical, bell-shaped, continuous distribution (see *Normal distribution*) with a single peak. Its probability density is determined by the following function:

$$f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2}$$

The distribution is therefore clearly determined by μ and N . Since many biological characteristics accord with the normal distribution, this form is often used. W.H.B.

Gefüge. See *Structure*.

Gegenstandstheorie. See *Object; Objective theory*.

Geisteswissenschaftliche Psychologie (Eng. *Cultural science psychology; Social science psychology*). French and English positivism (A. Comte, J. S. Mill) led to a general revision of the notion of science which had become widely accepted in Germany too. Either the natural sciences (*Naturwissenschaften*) were accepted as the only true science (Comte) or it was suggested that the social sciences (*Geisteswissenschaften*) were to be based on natural science (Mill), psychology being considered as a branch of biology.

At the end of the nineteenth and in the early twentieth century there was a very active movement in Germany which tried to establish a more balanced attitude by creating an objective, logical foundation for the cultural sciences (which, according to Dilthey, are, e.g., “history, national economy, the sciences of law and of the state, the science of religion, the study of literature and poetry, of art and music, of philosophical world-views and systems, and finally psychology”), based on cognition theory. Because all “cultural phenomena are associated with mental phenomena” it was thought necessary

to consider psychological thought processes and make a newly conceived psychology the theoretical framework and basic discipline for all the human sciences.

Since Dilthey (1883, ²1957) the term "*Geisteswissenschaft*" had been in general use; accordingly, the term "*Geisteswissenschaftliche Psychologie*" gained currency as a collective designation for the psychological trends which—unlike the empirical research of the natural sciences—concentrated their research on the investigation of meaningful individual experiences, value factors, and purpose. All three aspects are conceivable only in the "mental" or "spiritual" sphere (*das Geistige*). However, nothing could be "explained" *causally* in this sphere (as in the natural sciences), and only the principle of "understanding" (*Verstehen*) was considered valid, the individual experience of the "soul" or "psyche" (*Seele*) being approached indirectly through "*objective mind*" or "intellectual products" (art, culture), which form the external objective expressions of the human spirit in its lived experience. Since the meaning (value) with which cultural science psychology is concerned never appears as an isolated phenomenon but only in a certain *context*, it can only be experienced by means of a "complex psychic structure" (Dilthey, 1894, ²1957). For cultural science psychology, the principle of structure or development and the concept of *Ganzheit* (wholeness) or *gestalt* (configuration) were essential, because the structural tension and interaction of "experienced relationships" could only be described in this way. Dilthey and his followers (especially Spranger) used these notions to understand and describe feelings, aspirations, motives, character, and so on.

Methods. Understanding, re-experiencing (empathy, mimpathy), description, and interpretation are some of the methods used. Just as the natural sciences use the principle of "explanation", or "explication", cultural science psychology uses the principle of "understanding" psychologically to "penetrate" *objective* (meaningfully structured) and

personal life (the ego), and to re-experience the confrontation of the ego with the environment. Instead of explaining mental processes by cause and effect, E. Spranger (1918) defined "understanding" (*verstehen*) as the "basic function of the percipient consciousness", and as "penetration of the value system of a psychic context". According to Scheler (1937), it is an essential aspect of understanding "that we experience the actions (speech and activities) of others from a perceptive mental idea of them as intentionally directed toward a specific end so far as we and the environment are concerned, and ourselves complete these actions . . . although this form of completion does not entail co-judgment, approval, or other sentiments". Efforts to establish an objective, theoretical foundation for these methods has led to the division of understanding into two main areas: the understanding *of persons* (contact-understanding, intuitive- or perceptive-categorical and conceptual understanding), and the understanding *of objects*.

The further development of psychological research showed that the division between natural and social scientific aspects of psychology was restrictive; nowadays it is rejected by most psychologists.

Geisteswissenschaftliche Psychologie has value mainly in educational and cultural psychology. See *Verstehende Psychologie*; *General psychology*; *History of psychology*.

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Gemüt (Eng. *Total disposition*). The psychic and spiritual aspect of a person; the totality of

emotions, basic dispositions, moods and motivations. Whereas cognitive activity is characterized by knowledge, thought and judgment, *Gemüt* is expressed in feeling and personal lived experience. Education of *Gemüt* as opposed to training of understanding has played an important role in educational theory (especially in the nineteenth century, e.g. in a particularly intense form in F. Fröbel's work). The notion of *Gemüt* acquired major philosophical significance for the German Romantics and in the sect known as "Christian Science". Recently attempts have been made, primarily by Strasser (1956), to develop the fundamentals of a phenomenological philosophy from the concept.

Bibliography: Strasser, S.: *Das Gemüt*. Freiburg, 1956. *E.U.*

Gene. The hypothetical component of the hereditary substance (see *De(s)oxyribonucleic acid* = DNA) which, in a simple instance, controls the formation of an individual characteristic (e.g. curly hair in a guinea-pig). In molecular terms, a gene consists of several thousand DNA components (nucleotides), and the development of a characteristic always begins with the formation of a specific simple protein which then acts as a kind of catalyst for the reaction which leads to formation of the specific characteristic. If several genes are responsible for the development of a characteristic, it is known as a "polygenic" characteristic. *H.S.*

General ability. See *Abilities; Intelligence*.

General Aptitude Test Battery (GATB). A series of twelve tests developed by Beatrice J. Dvorak in the U.S.A. (U.S. Employment Service) to determine vocational aptitude. The eight pencil-and-paper tests and four apparatus tests cover a total of nine factors, the scores for which are presented in a profile.

Standard profiles for twenty-two vocational groups are available for comparison. The test battery was determined on the basis of a representative sample of about four thousand testees. According to Cronbach (p. 274), the reliability coefficients for the nine scales vary between 0.65 and 0.68.

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General factor (abb. G). If a factor which occurs in all observed variables can be extracted by means of factor analysis (q.v.), it is known as a general factor. In Spearman's factor model, there is a G (general ability) for as many specific factors (*s*) as there are variables. This assumption later proved untenable. *W.H.B.*

Generalization is a fundamental concept in learning theory. It denotes the fact that forms of behavior which were coupled with a specific stimulus situation in a learning process can be induced not only by this particular situation but also by other similar stimulus situations. The phenomenon is explained by I. P. Pavlov on the assumption of an irradiation of impulses by the cerebral cortex; C. L. Hull, on the other hand, postulates intermediate stimulus-reaction chains within the organism, while E. R. Guthrie traces the phenomenon back to common elements in stimulus situations. Generalization is used to explain phenomena such as transfer of practice (see *Transfer*), etc. The *generalization gradient* is the ranking of different stimuli according to the degree to which they evoke a response previously coupled with a specific stimulus. The generalization depends on the intensity of this association and has as many dimensions as the stimulus has variables.

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Generalized other. G. H. Mead's term for an organized group or community which (beyond relational individuals, or "significant others") endows the individual with a unified ego (q.v.) through group identity. It is assumed that the attitudes of the whole group coincide in the generalized other (e.g. the team in sport) and therefore form part of the experience of the individual group member. The actions of the individual are "controlled" by the fact that he remains himself while at the same time conforming to the attitudes of the others, i.e. is at the same time the "generalized other". A number of such groups are referred to as "generalized others"; those especially valued are "reference groups".

Bibliography: Mead, G. H.: *Mind, self and society: from the standpoint of a social behaviorist* (Ed. Morris, C. W.). Chicago & London, 1965. Rose, A. M. (Ed.): *Human behavior and social processes*. London, 1962. W.D.F.

General psychology. I. The implied emphasis is on general principles as opposed to individual variations (*differential psychology*), species differences (*comparative psychology*), and socio-cultural factors (*social psychology*). The word "general" has been used to refer to principles underlying such processes as learning, remembering, and thinking, and such activities as attention, motivation, and emotion. Some methodologists, e.g. John Stuart Mill (1843), have argued that psychology needs to be complemented by another discipline concerned with the study of individuality. Stern (1921) underlined the same point when he wrote: "the problems set by general psychology and by the psychology of the individual are quite different". G. W. Allport (1938), in arguing for the development of a psychology of personality, adopted a highly critical assessment of the value of general psychology in arguing "to abstract a generalized human mind from a population of active prepossessing well-knit persons is a feat of questionable value. The generalized human mind is entirely mythical; it lacks the

most essential characteristics of mind—locus, organic quality, reciprocal action of parts, and self-consciousness". This interest in individuality as opposed to general principles is traditional: it has a long history going back to Empedocles and Plato.

The term *general psychology* is ambiguous. A second usage is given by Chaplin (1968) as referring to "the broad synthesis of all findings and theories in the field as typified by an introductory textbook or course". (Compare the next article by Prof. P. Muller, which refers to this usage.) In this other sense, the term *general psychology* appears in the syllabus of many university courses, and in textbooks published at different periods of time: e.g. Murphy's *General Psychology* (1933), Valentine's *Experimental Foundations of General Psychology* (1941), Thouless's *General and Social Psychology* (1937), Kimble's *Principles of General Psychology* (1956), Das's *General Psychology* (1964). These and other such textbooks differ in content and do not necessarily exclude differential, social, and comparative psychology.

A distinction between *general* and *differential* psychology is supported by standard dictionary usage. Warren (1958 edition) defines general psychology as "the branch of psychology which seeks to discover what is true of individuals in general rather than of one individual or class of individuals as distinct from others". Warren's criterion is in terms of the goals or purposes of the investigator or writer concerned. English & English (1958 edition) similarly mention goals and purposes in distinguishing *general* from *differential* psychology. They also mention the dichotomy of *nomothetic* (concern to discover general laws) as opposed to *idiographic* (concern to understand particular events or individuals). Drever (1952) similarly defines general psychology as concerned with general principles of mental life "as distinct from peculiarities characteristic of the individual". And Chaplin (1968) similarly distinguishes general from differential psychology.

Illustrations will be taken from the main areas of the science to indicate the orientation of general psychology, and to distinguish it from other possible orientations. A number of opposing theories of learning, associated with such names as Guthrie, Hull and Skinner flourished in the 1930s and 1940s (Hilgard, 1948). These, together with the titles of leading books such as Hull's *Principles of Behavior* (1943), Skinner's *The Behavior of Organisms* (1938), and Hebb's *Organization of Behavior* (1949), exemplify the standpoint of general psychology, by contrast with, for example, Eysenck's application of Hullian theory to the elucidation of individual differences in learning, and perceiving. Within perception, the gestalt psychologists have frequently been criticized for their seemingly exclusive concern with general principles, as opposed to individual variations and personality differences. The title of one such critical paper "Where is the perceiver in perception theory?" illustrates this line of criticism (Klein & Schlesinger, 1949). In relation to memory, the early experiments of Ebbinghaus (1885) represent a significant contribution to general psychology from the standpoint of a single subject; Koffka (1935) attempted to apply general gestaltist principles to the memory field. The tradition of associationism (e.g. Bain, 1863) represents a general psychological approach to thinking as contrasted to the use of association techniques to study individual differences (e.g. Galton, 1883). Within the contributions of Soviet science may be noted the reflexology of Pavlov in its concern with general principles which have made an important impact upon the psychology of learning; this may be contrasted with Pavlov's own interest in typology, and the elaboration of this aspect of differential psychology by B. M. Teplov and his associates.

Historically, general psychology has been closely associated with the method of experiment, in the strict sense of systematic manipulation of experimental variables. By contrast, differential psychology has been

historically associated with psychometric methods, and social psychology with observation of a more controlled, or less controlled kind. These connections have been historical, rather than logically necessary ones, and are much less apparent in the contemporary scene. In the early scientific period Wundt, Titchener and others made substantial use of introspective report in developing their general psychology. The classic researches of Sherif on the autokinetic effect have pioneered the by now vigorous use of experiment in social psychology (Sherif, 1936). Experimental methods received early application to personality and clinical research, in for example the study of "how a fear may be removed under laboratory conditions" by Mary Carver Jones (1924). More recent work in this tradition involving "the application of experimental method to the single case" is to be found in, for example, the study by Shapiro & Nelson (1955). Because of these developments, many of which have a long history, any equation of "scientific" psychology with either "experimental" psychology, or "general" psychology, is questionable and misleading.

The distinction between nomothetic (concern with the discovery of general laws), and idiographic (concern with a single event or specific individual), may be noted in connection with general psychology. Of interest is the fact that the size of the population studied is not necessarily a criterion to be used in differentiating the nomothetic from the idiographic. This is particularly apparent if we deal with a population of $N = 1$. Hence Ebbinghaus sought to formulate and test hypotheses, using a single subject, with a view to discovering general principles relevant to understanding, remembering and forgetting. Freud similarly sought to discover the general principles underlying dreaming, using data primarily on himself. With such work may be contrasted studies that have been made of individual cases, with a primarily idiographic orientation. In the early period, Morton Prince (1909) studied the dissociative

behavior of Christine Beauchamp in this way; more recently Luria (1968) has studied, over a period of thirty years, a single case involving unusual capacity for remembering, synesthesia of a variety of kinds, and highly limited capacity for forgetting. Individuals who exhibit pain blindness merit idiographic study of a similar kind, but these also may yield information of interest to general psychology, as showing how absence of the sense of pain can affect learning as such (Mowrer, 1950). Similarly Luria's study, though primarily idiographic, may have important implications for the understanding of the general psychology of retention and forgetting.

The notion of general principles or laws of psychology, which are completely or approximately universal, is less widely adhered to than formerly. Individual variations, developmental stages, greater or lesser deviations from the normal, and both species and social differences, are all today fields of intensive, and legitimate, research. Wundtian over-preoccupation with the normal, adult, human, introspective observer, has been modified by the impact of several movements, including Watsonian behaviorism: this staked out a claim for both developmental and comparative psychology. Allport's influential book (1938) firmly established the field of personality-orientated psychology. If McDougall (1908) was concerned with instincts or propensities as generally present motivational variables, H. A. Murray and others have since developed a personality-centered approach to this same field of motivation. The functional perception movement of Bruner and others has sought to correct what the leaders of this group viewed as a narrowly general psychological approach, and to develop the differential psychology lacking in this area. Leading theorists in the field of learning, such as Mowrer (1950) and Skinner (1968), have devoted their recent attention to the study of personality differences in learning on the one hand, and the problems of the individual learner in the classroom, on

the other. The concept of general psychology, though perhaps of questionable value today, provides a reference point in terms of which we can view some of these historical, and modern, developments.

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T. P. H. McKellar

General psychology. II. The interdisciplinary view. There are two accepted meanings of the term "general psychology": the first refers to the contents of an introductory course in the subject, the basic knowledge every psychologist should have before specializing in one or other of the different branches of modern psychology; "general psychologies" in this sense are to be found in various manuals (e.g. R. Kimble's *Principles of General Psychology*, New York, 1956; or the large *Handbuch der Psychologie*, I: *Allgemeine Psychologie*, edited by W. Metzger). The second meaning, the one with which this article deals, refers to problems of *method*, to the *interpretation* of psychological data, and to the *cultural* or *philosophical implications* of psychology. To be even more precise, this article is mainly concerned with the relationship between psychology and philosophy (another article discusses methodological problems, see *Philosophy and psychology*).

Psychology is a science which has existed for a long time yet possesses only a brief recorded history (Ebbinghaus, 1885); it has had some difficulty in emerging from the philosophical mold common to all traditional branches of knowledge in the West. It is now becoming apparent that psychological problems are already present in myths (in so far as these are always about man's place in the world); that they are reflected in the earliest philosophical theories; and that they then become increasingly precise in the great traditional systems of thought. Thus the "Psychology" section in Janet & Seailles' *L'Histoire de la philosophie* (1st edition, 1886) includes chapters on the following: animal life, the senses and external perception, consciousness, theories of reason, memory, association of ideas, language, sensitivity, problems of freedom, habit. Each of these chapters traces through the ages the discussion of the problems which experimental psychology, with its laboratory techniques and concern for strict verification, had taken up from 1860 onward.

A similar situation can certainly be found in the other sciences. But whereas the advent of the experimental method in physics, with deductions based on the testing of hypotheses, severed the links between physics and philosophy (at least in principle, if not in the mind of each individual physicist), nothing of the sort has happened in psychology, in spite of the constant efforts of a great number of scholars. In opposition to the earliest scientific psychology of the pioneers (1860–1912) came protests by Bergson, Dilthey, Brentano, Husserl and, finally, Natorp. In the confused era between 1912 and 1930 several psychologists expressly laid claim to philosophical methods (e.g. the "phenomenological psychology" of M. Scheler and of A. Pfänder, continued later in France by J.-P. Sartre and Merleau-Ponty). Finally, even when, from 1930 onward, there was greater unanimity concerning psychology as the "science of behavior", those who thought in depth about psychology continued animatedly

to discuss the very possibility of an "objective" science of human behavior.

Philosophy aspires to conscious coherence in the concepts it uses to describe and to understand itself, and thus necessarily *reflects upon itself*. To this extent, somewhere along the line philosophy encounters objective psychology as a rival approach. The reason for this is that objective psychology includes a theory of cognition, and therefore considers the conditions governing knowledge while simultaneously itself claiming to be this knowledge. Is it possible to use concepts of objectivity borrowed from science to construct a subject capable of developing precisely the objective knowledge in question? Can "instrumental" reason of the type used in technology (Pradines) explain itself? Can it do without *dialectical reason*?

Apart from renewing this investigation into the preconditions for psychology (the *critical* question *par excellence*), general psychology should be concerned to describe the factors which make up the three things with which it is primarily concerned: behavior, experience, and other people in so far as they are personal agents. Experimental psychology always assumes that these basic problems have been resolved, whereas it is at this level that the distinction between natural ("physicalist") science and the various human sciences is worked out.

At a less fundamental level, general psychology describes the social conditions necessary for the birth of psychology, the epistemological limits implied by the three types of psychology (experimental psychology in the third person, clinical psychology in the second person, and phenomenological psychology in the first person), and the existential conditions inherent in any attempt by existence to come to terms with itself. From this point of view, scientific psychology will only become appropriately coherent by raising itself to the level of a "meta-psychology". See *Phenomenology*.

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Generation (*Alternation of generations; Metagenesis*). In the biological sense, a generation is the complete life cycle of an organism from the fertilized ovum (zygote) to the sexually mature individual, who himself in turn develops sex cells and produces offspring.

The *alternation of generations* is alternation between generations produced in a different manner. The term *heterogony* means that offspring are produced in different ways from the sex cells, e.g. one generation from normally fertilized ova and the next from unfertilized ova (see *Parthenogenesis*) as is the case, e.g., in water fleas and *Phylloxera vastatrix*. On the other hand, an alternation of one generation produced by a sexual and the other by an asexual process is known as *metagenesis*. E.g.: the *coelenterata*. The jelly-fish produces, by normal sexual processes, zygotes from which polyps develop. The polyp in turn produces the jelly-fish generation by asexual means, through blastogenesis. *H.S.*

Generation gap. Commonly observed problems and conflicts in the different forms of interaction between young people and mem-

bers of the older generation (youthful protests against rules made by parents and teachers, sometimes also demonstrations against political decisions—which are generally made by members of the older generation). Possible explanations for these phenomena: (a) incompatible attitudes in the two age groups: a conservative attitude aiming to maintain the benefits of past achievements on the part of the older generation, and a tendency for the younger generation to be progressive, force changes, and improve traditional patterns by innovation; (b) a stereotyped approach on both sides to members of the other group; young people consider their elders to be obstinate, obstructive and outmoded, while they themselves are accused by their elders of showing an inadequate sense of responsibility, lack of experience and idleness, i.e. they are not recognized as adults. See *Authoritarian personality; Prejudice; Stereotype*.

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Generative glands. See *Gonads*.

Genetic psychology. See *Development; Traits*.

Genetics. The theory of heredity. The physical and mental characteristics formed during the process of individualization of a living being are primarily conditioned by inherited factors (see *Gene*) in the sex cells. A secondary modification of these characteristics through environmental influences can only take place within the framework of modification determined by these inherited factors. Genetics studies both the extent to which characteristics are genetically conditioned, i.e. the extent of the modification range determined by heredity, and the way in

which heredity conditions the development of characteristics by chemical and physical means (*molecular genetics*).

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Geneva scheme. Compilation of main features for work evaluation systems, developed by the ILO (International Labor Organization) in Geneva in 1950. *G.R.W.M.*

Geneva school. A designation for the branch of developmental psychology founded by J. Piaget and his co-workers (especially B. Inhelder and A. Szeminska). With its studies of the development of intelligence and perception (since 1921) and of genetic epistemology (since 1950), the Geneva school has made one of the most valuable and extensive contributions in this field. J. Piaget's theories can be understood most readily in the light of functionalism (J. Dewey, J. Mc. K. Cattell, E. Claparède).

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Geniology. See *Giftedness; Genius*.

Genital stage (syn. *Genital phase; Genital period*). Divided by Freud into an early and late genital phase. In the early phase, also known as the Oedipal (Oedipus) phase (app. four and five years of age), a child becomes interested (among other things) in his sexual organs. He becomes aware of the anatomical difference between the two sexes, and begins to accept the existence of two sexes and his own sex as a reality. According to Freud, this interest is connected with self-manipulation (of the sexual organs) and, in addition to previous forms of contact, with a desire for specific sexual contact with the

parent of the other sex. The boy no longer looks upon his mother merely as a person who cares for him and makes demands on him, but also as a woman. He exhibits his newly discovered "manliness" (see *Phallic stage*); lays claim to his mother's sole attention; and thus comes into conflict with his father. The girl continues to look upon her mother as a person who makes demands and fulfills needs, but turns toward her father with the onset of heterosexual interest—i.e. to a person who is psychologically more novel for her—and therefore comes into conflict with the mother. The conflicts are resolved with increasing adequacy during the early genital phase, usually by partial repression of sexual interest in the parent of the opposite sex, and by identification with the parent of the same sex. These interests are generally repressed less strongly by a girl than by a boy; she remains attached to the father as an object of heterosexual love rather more strongly than a boy remains attached to the mother. The total bond between a son and his mother is, however, often somewhat stronger than a girl's attachment to her mother (or father), because he does not have to give up his primary object of love in the early genital phase as a girl must. Fixation and subsequent regression to the early genital phase may lead to hysteria (q.v.) (anxiety hysteria and phobia on the one hand, conversion hysteria on the other) and to homosexual perversion (see *Homosexuality*); and, in cases of less traumatic attachment in the early genital phase, to impotence or potency problems in the man, and to frigidity and vaginism in the woman. Instead of specific neurotic symptoms, a character change may also occur, i.e. a hysterical personality may develop. This personality type tends to a greater extent than other individuals to look upon social situations as sexual trial situations, and to satisfy his interests in a confused and apparently dishonest manner, or to react with excessive anxiety and defense. In the late genital phase, which begins after the latency phase in puberty, the young person

develops an increasingly realistic interest in individuals of the opposite sex, who are generally of much the same age. The late genital phase extends throughout adult life.

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W. Toman

Genius. A high level of intellectual ability. Research on the subject generally takes an IQ of 135 or 140 as the lower "limit of genius". This definition would include between 0.5 and 1 per cent of the population, i.e. the most gifted. See *Giftedness; Abilities*. K.P.

Genome; Genome mutation. "Genome" denotes the totality of genetic material (hereditary substance) present in a cell. Since this material is localized on the chromosomes, in general all the chromosomes present in a cell are defined as the genome.

Genome mutation is the chromosomal alteration which occurs under physical or chemical environmental influences. For example, the whole set of chromosomes, or individual chromosomes, may be doubled.

H.S.

Genotype. The totality of hereditary dispositions of an individual (see *Phenotype*). Individuals with the same genotype may show varying features, because of differing environmental influences during their development, but only within the genetically fixed range of variation.

H.S.

Geometric mean. The geometric mean (G) of a quantity of N positive values—a measurement of the central tendency of the distribution—is the N th root of the product of these values (means):

$$G = \left(\prod_{i=1}^N X_i \right)^{1/N}.$$

If a geometric mean exists, it is situated between the harmonic (q.v.) and the arithmetic mean (q.v.).

W.H.B.

Geometrical-optical illusions. Geometrical-optical illusions in the wide sense represent one form of perceptual illusion. They may occur in three-, two- and one-dimensional patterns in the field of vision, in regard to size, shape and position, distance and direction of observation, and may also affect the (metric) relationship between these factors.* Illusions of this kind in the narrow sense occur if, in the case of a figure presented on a frontal-parallel plane, the phenomenal distance, angular, directional or curvature characteristics deviate from their original correlates. Illusions in this narrower sense are dealt with in the remainder of this article.

Studies of these phenomena began in the mid-nineteenth century. Initially the various illusions—named after their discoverers (J. J. Oppel, F. Zollner, J. C. Poggendorff, etc.)—were only demonstrated, by means of a drawn figure. Quantitative analyses were added at the turn of the century. A figure which is still generally known as the Müller-Lyer illusion (q.v.), but was in fact developed much earlier by Oppel, was frequently adduced as an example. In figures of this kind, phenomenal equivalence is assumed between the section i which "undergoes the illusion" and a variable, isolated comparison value; the difference between i and the isolated value which appears equal to i ("equivalent" value) is the measure of (absolute) illusion. Hofmann summarized the literature on this subject in 1920. Later on, other figures were added, e.g. a parallelogram-diagonal illusion generally named after F. Sander, but already described previously by M. Luckiesh, which has been studied in particular detail.

Of the many incorrect attempts to explain such illusions, some (a) referred to the peripheral sense organ (the structure of the retina, its curvature, functional irregularity, spatial

values, eye movements, etc.; and others (b) to previous experience relating in particular to perspective, to confusions, errors of judgment, etc. The hypotheses referred to in (a) above, as well as the perspective theory, are refuted by the fact that they do not also explain the analogous haptic illusions (q.v.). Although contradictory evidence does not prevent the outmoded explanations from being quoted occasionally today, it has become increasingly clear that these illusions are not determined by peripheral conditions or superimposed information from the memory or reasoning, but that their origin lies in central processes of configuration (gestalt formation). This is confirmed by the fact that there are many functional relationships between these illusions and such phenomena as apparent movement which are known to be centrally conditioned.

There has been much research into geometrical-optical illusions in recent decades, and work is still continuing. Research has concentrated on three partially overlapping areas: (a) *Principles and methods* of measurement have been developed by introducing the phenogram, i.e. the total-figural equivalent, instead of partial value equivalents; (b) *Functional analysis* has led to the following discoveries: the phenomenal metrics varies with the phenomenal structure; pregnancy tendencies and other intra-figural forces may cause illusions; fixation and attention characteristics, contrast and adaptation, are again taken into account for explanatory purposes from new points of view; there are points of relation between geometrical-optical illusions and figural after-effects; excessively long consideration of a single figure leads to a reduction in the degree of illusion; (c) These illusions have been applied primarily in developmental psychology and personality theory, where it has been found that there is no general "illusion characteristic" (whose extent, varying from individual to individual, could be used to indicate a state of development or type). The principles of cognition theory which hold good for perceptual illu-

sions are particularly applicable to geometrical-optical illusions (see *Perception, illusions of; Visual perception*).

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E. Rausch

Geopsychology. A scientific discipline and research area, in which the natural environment is studied in its relationship to behavior and mental states. A distinction is made between four principal factors (Hellpach): the influences of weather, climate, soil and landscape. After preparatory work and studies by Montesquieu and C. Lombroso, this subject is becoming increasingly important today in the context of the study of problems of human life under abnormal or atypical conditions: in the polar areas, tropics, bases on the sea-bed, interplanetary space. Some of the work of geopsychology has now been taken over by rhythm research; in biological anthropology, geopsychological problems are considered from the ecological standpoint.

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P.M.

Geotaxis. Alignment and movement of lower organisms as a function of gravity as the releasing stimulus. A distinction is made between movement in the direction of the force of gravity (positive geotaxis), and movement in the opposite direction (negative geotaxis). See *Taxis*.

F.C.S.

Geriatrics. Medical research into the phenomena of old age (pathological conditions of old age) is a branch of gerontology (q.v.) and was first elevated into a scientific discipline by the work of M. Burger and E. Abderhalden in the 1930s. It provides valuable information for "social" gerontology, a field of study founded at international level in 1950, in order to help in remedying the increasing social problems encountered by the aged. See *Aging*.
F.N.

Gerontology is the science of aging. The term derives from the Greek *geron*—old man, and came into use in the early part of the twentieth century with the increased scientific interest in the processes of aging. The appearance in 1939 of *Problems of Ageing*, edited by E. V. Cowdry, reflected the growing interest in research into aging. Technologically advanced countries now provide conditions in which large numbers of persons survive to old age; hence studies of aging are undertaken from the viewpoint of social science as well as of biology.

Gerontology can be regarded as having three major divisions: biomedical, behavioral, and social. Biomedical problems of aging clearly show the interaction of the biological aging of the organism and its susceptibility to disease. Research on the biology of aging includes the study not only of man but of lower organisms, cells and subcellular components (Comfort, 1964). The behavioral aspects of gerontology include the consideration of man psychologically (as he ages individually), and sociologically (as a member of a group) (Birren, 1959). Social gerontology is concerned particularly with the implications of man's aging in society. The presence of large numbers of retired and older persons in a society has implications for economics, social welfare, and the distribution of health and other services (Tibbitts, 1960).

Most scientists would agree at present that there is no single mechanism of aging—for example, a single *lethal gene* that governs the

length of life. It is probable that the biological processes of aging are controlled by the action of many genes; but the conditions under which the animal is conceived, matures and ages are also important in accelerating or retarding the processes of aging. Important issues in gerontology include: the problem of the identification of the origins of molecular errors or faults that occur in aging cells; discovering the basis of changes in memory with age; identifying the conditions predisposing to alienation and poor life-satisfaction for older persons; and determining the extent to which continuous physical and mental activity retards regressive changes of aging. Many biomedical problems also exist in our limited understanding of the etiology of diseases associated with advancing age. Research and scholarly activity devoted to gerontology will very likely develop as industrial prosperity increases, and as the growing number of older persons in society gives cause for concern about the optimum conditions for human life in the second half of the life span (see *Aging*).

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J. E. Birren

Gerontophilia. A sexual deviation in which the age of the partner plays a decisive part: sexual attraction by and preference for much older persons. Gerontophilia is the extreme opposite of pedophilia (q.v.), in which the sexual attraction diminishes, and finally ceases altogether, as the partner grows older. Gerontophilia may also occur as a secondary phenomenon in the context of a different sexual deviation, e.g. homosexuality, or may be linked with fetishism (Kronfeld, 1923). Hirschfeld interpreted gerontophilia as an "infantile fixation on older persons". Whether it is pathological, i.e. a sexually "perverse" attitude in the clinical sense, must be determined in each individual case.

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Gesell, Arnold. *Life and works:* B. 21/6/1880, Alma, Wisc.; d. 29/5/1961, New Haven, Conn. He studied psychology at Clark University where he took his Ph.D. in 1906; intermittent teaching work thereafter; in 1911 he founded the Clinic of Child Development at Yale University, New Haven, which he continued to direct until his retirement in 1948. He trained in medicine while assistant professor in Yale and passed his M.D. in 1915; he edited the *Journal of Genetic Psychology* from 1926.

Gesell is widely considered to be the "father of child psychology". He wrote more than fifteen books on child psychology and helped this branch of psychology to gain wide popularity even among laymen. His research method consisted in simple, accurate observation of children's behavior, generally with the aid of film cameras and one-way mirrors; he also made observations under controlled test conditions. The results of his studies take the form of minute descriptions of widely varying aspects of the behavior of children and young people at different ages. The chronological development summaries prepared in this way imply standards governing the development of children in the areas of behavior under consideration and are intended to help in predicting subsequent mental development. In reality, these aims were not satisfactorily met, particularly because the observational material on which the studies were based was much too narrow (sometimes only eleven cases) for individual age groups, and unrepresentative. Gesell's approach was purely descriptive. It consisted in the description and classification of individual findings without any attempt to lay down a theory of mental development or analyze the factors which influence it. The process of development appears as something mechanical and

immutable in his work. He overemphasizes the constitutional aspect and cyclical nature of development, while underestimating the significance of individual variations, and of cultural and social influences on development.

Major works: The mental growth of the pre-school child. New York, 1925. Infancy and human growth. New York, 1928. An atlas of human behavior: a systematic delineation of the forms and early growth of human behavior patterns, Vols. 1 & 2, New Haven, 1934. The feeding behavior of infants: a pediatric approach to the mental hygiene of early life. Philadelphia, 1937 (with F. L. Ilg). Reciprocal neuromotor interweaving: a principle of development evidenced in the patterning of infant behavior. *J. Comp. Neurol.*, 1939, 70, 161–80. The first five years of life: a guide to the study of the pre-school child. New York, 1940 (with others). Twins T and C from infancy to adolescence: a biogenetic study of individual differences by the method of co-twin control. *Genet. Psychol. Monogr.*, 1941, 24, 3–122 (with H. Thompson). Infant and child in the culture of today: the guidance of development in home and nursery school. New York, 1942 (with F. L. Ilg and others). The child from five to ten. New York, 1946 (with F. L. Ilg). Vision, its development in infant and child. New York, 1949 (with others). Child development: an introduction to the study of human growth. New York, 1949 (with F. L. Ilg). Arnold Gesell. In: Boring, E. G., *et al.* (Eds): *A history of psychology in autobiography* Vol. 4. Worcester, Mass., 1952, 123–42.

W.W.

Gesell Development Schedules (GSCH), also Gesell Development Scales, Gesell Norms of Development, Gesell Tests, Pre-school Child Test, Yale Test of Child Development. The schedules were published by A. Gesell in 1925 as a "general development test" and afterwards substantially modified (Gesell & Amatruda, 1947); they led to the preparation of other development tests (H. Hetzer, C. Bühler, etc.).

Structure: selected items for key age (infants, or pre-school children), maturity and four behavior categories corresponding to the developmental concept: "the young child is as old as his behavior".

Application: GSCH were used for development diagnosis (to estimate the development quotient) of normal and impaired children between the ages of 0 and 6; they were used primarily to determine suitability for adoption and for prediction of atypical and abnormal development processes such as amentia, brain damage, blindness, etc. The *reliability coefficients* are between $r = 0.79$ and $r = 0.88$. *Validity* (correlation with other development tests) is quoted as $r = 0.37$ to $r = 0.74$.

Bibliography: Gesell, A. & Amatruda, C. S.: Developmental diagnosis. Normal and abnormal child development. New York, 1947. *F.N.*

Gestalt. See *Ganzheit*; *Structure*.

Gestalt form, quality. See *Ganzheit*.

Gestogens (syn. *Progestins*; *Progestogens*). Progestational hormones which prepare the lining of the womb to ensure that the fertilized ovum is implanted (see *Uterus*) and that pregnancy proceeds smoothly (hence known also as "pregnancy hormones"). They provide the developing ovum with optimal protection in the uterus. The most important of these natural (physiological) gestogens is *progesterone* (Micryston progesterone). Gestogens in a wider sense are synthetic hormones. They are administered as oral contraceptives (see *Contraception*) and are also used in the treatment of other disorders, such as acne and excessive menstrual bleeding. *H.M.*

g factor. A term used in the literature of factor analysis for general factor (q.v.).

W.H.B.

G factor. A personality factor ("superego strength") derived by R. B. Cattell by factor analysis and included in Factor VI of the second order (volitional control and persistence). *W.H.B.*

Gibson effect. A group of negative after-effects that set in after prolonged observation of special patterns (field of uniformly curved lines, pattern of oblique lines, etc.) as a result of adaptation (q.v.). The term is used in the literature to distinguish this phenomenon from figural aftereffects (q.v.) and negative aftereffects in Stratton's experiment (q.v.).

Bibliography: Gibson, J. J.: Adaptation, after-effect and contrast in the perception of curved lines. *J. exp. Psychol.* 1933, 16, 1-31. *A.H.*

Giftedness, research into. The study of the causes and factors of high intellectual ability (see *Genius*) and its distribution and forms. Studies by L. M. Terman of the development of highly-gifted individuals have shown that these persons are also, e.g., emotionally more stable (less neurotic). The theory subscribed to by, e.g., Lange-Eichbaum (1928) that genius is accompanied by deficient emotional and social adaptability must therefore be rejected. Family studies have shown that giftedness occurs frequently in several members of a family; genetic factors and (above all) factors connected with the family environment are probably responsible for this. Qualitative research into giftedness (e.g. examination of the factors in thought processes and problem-solving strategy which make possible the creative achievements of genius) is still in the early stages. See *Abilities*; *Creativity*; *Intelligence*.

Bibliography: Anastasi, A.: Differential psychology. New York, 1966. Guilford, J. P.: The nature of human intelligence. New York, 1967. Lange-Eichbaum, W.: Genie, Irrsinn und Ruhm. Munich, 1928. Terman, L. M. *et al.*: Genetic studies of genius,

Vols 1-5. Stanford, 1926-59. **Vernon, P. E. (Ed.):** Creativity. Harmondsworth, 1970. **K.P.**

Gilbreth chronoscope. An instrument fitted with a large dial and used for measuring minute units of time. It finds application in the study of slight movements recorded cinematographically. The time units and the movements are recorded simultaneously on the film, so that the sequence of movements can be plotted against time. **A.Th.**

Glandotropic hormones. Hormones (q.v.) of the anterior lobe of the pituitary that stimulate hormone production in the endocrine glands. The most important are: *adrenocorticotrophic hormone* (ACTH, q.v.), which stimulates production of adrenal hormones (corticosteroids, q.v.); *thyrotrophic hormone* (thyrotropine), which stimulates production of thyroid hormones; gonadotropins (q.v.), which stimulate production of sex hormones (follicle stimulating hormone, luteinizing hormone, luteotropic hormone). The production of glandotropic hormones is governed by many factors, especially by the hormones present in the blood and produced in the peripheral glands (negative feedback) and by the releasing factors of the hypothalamus.

Bibliography: **Harris, G. W.:** Neural control of the pituitary gland. London, 1955. **Harris, G. W. & Donovan, D. T.:** The pituitary gland, Vols 1-3. London, 1966. **Szentagthai, J., Flerko, B., Mess, B. & Halasz, B.:** Hypothalamic control of anterior pituitary. Budapest, 1962. **W.J.**

Glands. Organs of the body which produce special secretions. *Endocrine* glands such as the thyroid gland (q.v.), the adrenal glands (q.v.), the islet cells of the pancreas, the ovaries and the testes discharge hormones into the blood stream, whereas *exocrine* glands such as the sweat, sebaceous, lacrimal, salivary, and digestive glands release their contents to outside the body, or the gastro-

intestinal tract. According to their histological structure, glands are divided into the acinous and the tubular, and the latter may themselves be divided into straight, coiled or branched. The masses of lymphatic tissue wrongly called "lymph glands" are more correctly described as *lymph nodes*. **E.D.**

Glandula pituitaria. See *Hypophysis*.

Glare (Dazzle). A diminution of visual performance (visual acuity, differential, form and color sensitivity, depth vision, etc.) as a result of inadequate lighting, or of a visual environment unfavorable to visual characteristics. In the narrower sense, glare defined by visual performance is called disability glare, or physiological glare, in contrast to discomfort glare, or psychological glare, which is defined by a diminution of the comfort, well-being, etc., of an individual or group of individuals.

Kinds of physiological glare: (a) absolute glare: too high light intensities, adaptation to which is impossible; (b) adaptation glare: sudden change of the light-intensity level; (c) relative glare: too great contrasts relative to the light-intensity level; (d) direct glare: glare coming from the light source itself; (e) indirect glare: reflection images, e.g., from light sources; (f) in-field and (g) peripheral field glare: cause of glare central or peripheral; (h) simultaneous and (i) successive glare: whether the cause of glare operates during or after its presence, and (j) fog or haze glare: the result of extensive and illuminated expanding media such as fog, smoke, curtain material, etc. For quantitative relationships see H. Schober (1964).

Bibliography: **Schober, H.:** Das Sehen. Leipzig, 1964. **A.H.**

Glia cells. The brain contains about ten times as many glia cells as nerve cells. Glia cells form the non-neural part of the brain tissue.

It is estimated that the human brain contains 100–130 thousand million glia cells, classified by shape into astrocytes, oligodendrocytes and microgliaocytes (frequency ratio 60:30:10). Their frequency distribution varies from one region of the brain to another. They are regarded as transmitters in the process of biochemical interchange. It has not yet been determined with absolute certainty to what extent glia cells participate in neural processes. Importance attaches to the glia index $N_g L / N_{neur}$, where N_{gl} is the number of glia cells and N_{neur} the number of neurons. This index is useful for a comparison of the various layers and regions of the brain. Moreover, it provides an indicator for specific physical as well as mental disorders, and changes characteristically in the course of ontogenesis and phylogenesis. *M.A.*

Global learning consists in mastering the material to be studied, e.g. a poem or piece of music, by tackling it and committing it to memory as a whole. The effectiveness of this method increases with the student's familiarity with it, his intelligence, and the meaningful content of the material and the systematic way in which it is put together. It declines if the material is too lengthy, contains difficult passages, and follows a natural pattern. *G.H.*

Glucagon. A polypeptide hormone secreted in the islands of Langerhans (q.v.) in the pancreas. By breaking down glycogen in the liver it increases blood sugar concentration. Glucagon stimulates the production of insulin (q.v.). It probably exerts only a slight influence on the onset of diabetes. Glucagon is used in the treatment of severe hypoglycemic disorders.

Bibliography: Foa, P. P.: Glukagon. In: *Ergebnisse der Physiologie, biologischen Chemie und exp. Pharmakologie*, Vol. 60. Berlin, 1968. *W.J.*

Glutamic acid. A mono-amino-dicarboxylic acid manufactured as needed in the body and

supplied to the organism, together with other amino acids, either in dietary albumin or in pure (or synthetic) form. It is of primary importance in the intermediate metabolism, and serves in the organism as a precursor of GABA (gamma-amino-butyric acid, q.v.). Glutamic acid has aroused special interest among psychologists because it is understood to raise mental performance among persons of low intelligence when administered over a protracted period. There have been numerous investigations, but owing to the inadequacy of the methods used, no clear interpretation is possible. No psychological effects are found after a single administration of glutamic acid.

Bibliography: Astin, A. W. & Ross, S.: Glutamic acid and human intelligence. *Psychol. Bull.*, 1960, 57, 429–34. Lingmüller, V.: *Biochemie, Physiologie und Linik der Glutaminsäure*. Aulendorf, 1955. Vogel, W., Broverman, D. M., Dragus, J. G. & Klaiber, E. L.: The role of glutamic acid in cognitive behaviors. *Psychol. Bull.*, 1966, 65, 367–82. *W.J.*

Goal gradient. C. L. Hull's term for a regular increase in efficiency while approaching a goal.

Goal orientation. The tendency to orientation toward the goal. *K.F.*

Goal orientation device. See *Maze learning*.

Golden mean (syn. *Golden section*). An esthetic ratio of division in which the *whole* bears the same proportion to the *larger* part as the latter to the *smaller*. *W.H.B.*

Gonadodysgenesis. Failure of the sex glands to develop in accordance with genetic constitution, resulting in anomalies such as an individual with XY chromosome structure manifesting female form. *G.D.W.*

Gonadotrop(h)ic hormones. Active hormonal

substances (albumin compounds) that act directly on male or female gonads (testes, ovaries), stimulating and controlling their growth as well as their endocrine function (production of male or female sex-hormones) and their exocrine function (production of semen, spermatozoa in man; ova and ovaries in woman). They are not sex-specific.

Two groups of gonadotropic hormones are distinguished:

1. *Pituitary gonadotropins*, secreted in the anterior pituitary under the influence of releasing factors of the hypothalamus: (a) FSH (*follicle stimulating hormone*) which stimulates the growth of ovarian follicles and, with gonadotropin, brings on the onset of LH maturity and estrogen production of the follicle; and in man the growth of mature sperms in the seminiferous tubules; (b) ICSH (*interstitial cell stimulating hormone*; in woman also LH, luteinizing hormone), which controls in particular the secretion of sex hormones in male and female gonads; (c) LTH (*luteotropic hormone*), which stimulates the growth and onset of maturity of the female breast (lactogenic hormone).

2. *Placental gonadotropins*, secreted only during pregnancy: (a) HCG (*human chorionic gonadotropin*), is produced in bulk in the placenta; (b) HPL (*human placental lactogen*), produced in the placenta, supports the action of HCG; (c) PMSG (*pregnant mare serum gonadotropin*), which is present in large quantities in the serum of pregnant mares (characterized biologically by a powerful follicle-stimulating effect).

Hormonal regulation mechanisms between primary stimulating centers (anterior pituitary, hypothalamus) and periphery (sex glands) are basically the same in the two sexes. The interaction of gonadotropic and sex hormones proceeds on the lines of a feedback system (e.g. FSH brings on, jointly with LH, the onset of follicular maturity and estrogen production; increasing estrogen production, in turn, slows down FSH secretion in the anterior pituitary). This feedback effect is the basis of hormonal contra-

ception: gonadotropic production is blocked by a constant inflow of estrogens and gestogens, so that the rhythm of the female cycle is interrupted, inhibiting ovulation and, therefore, fertilization.

Bibliography: Suhl, A. M.: Gonadal hormones and social behavior in infrahuman vertebrates. In: Young, W. C. (Ed.): Sex and internal secretions. Baltimore, 1961. Voigt, K. D. & Schmidt, H.: Sexualhormone. Hamburg, 1968. H.M.

Gonadotropins. Glandotropic hormones (q.v.) of the anterior pituitary that stimulate production of sex hormones (q.v.). The 3 main gonadotropins are the *follicle stimulating hormone* (FSH, Prolan A), the *luteinizing hormone* (LH), the *interstitial cell stimulating hormone* (ICSH, Prolan B) and the *luteotropic hormone* (LTH, prolactin). The secretory mechanism of gonadotropins is largely unaccounted for. The often alleged reduction of gonadotropins under stress has not been confirmed by recent investigations.

Bibliography: Albert, A. (Ed.): Human pituitary gonadotropins. Springfield, Ill., 1961. Apostolakis, M. & Voigt, K. D.: Gonadotropine. Stuttgart, 1964. Giuliani, G.: Studies on gonadotropin release during stressful situations and the role of the central nervous system. In: Bajusz, E. (Ed.): Physiology and pathology of adaptation mechanisms. Oxford, 1969. W.J.

Gonads. *Sex glands*: in man the testis, which produces the male sex hormone (androgen); in woman the ovary, which produces the female sex hormone (estrogen and *corpus luteum* hormone). The testis also produces spermatozoa (sperm), while in the female ovary an ovum ripens every four weeks. The gonadal hormones exert considerable influence on the formation of secondary sex organs, the physique structure of both sexes, and the individual's behavior as a male or female.

E.D.

Goodenough Test (*Draw-a-Man test*, DAM). A non-verbal intelligence test for children

of 3–13 years. The child is required to draw a man. The simple evaluation technique, intelligence-age norms, and a satisfactory degree of reliability, assure the test widespread use. The existence of significant relationships with general intelligence and social adaptation factors has been established.

E.F.-K.

Gosset chart. The tabling of "Student's" t distribution of critical probability α and sample size N . With its aid the t test (q.v.) for the statistical testing of significance can be speeded up.

W.H.B.

Gottschaldt's figures (*Embedded, hidden figures*). Complex sets of figures in which part-figures of the simplest kind can be isolated, recognized or perceived only with difficulty because of their structural embedding in the overall figure, in whose structure they lie concealed. Test figures of this kind characterize the factor "flexibility of closure".

H.H.

Gradient, approach-avoidance. According to N. E. Miller's goal gradient theory, approach and avoidance gradients are *curvilinear* functions of the *proximity of the goal* and *drive strength*. Approach and avoidance tendencies, which arise in typical conflict situations and under ambiguous stimuli, and are measured, for example, by answers in the Thematic Apperception Test (TAT), and by skin resistance, can be represented graphically as gradients. The point at which the gradients intersect is that of the maximum degree of conflict and, depending on the type of conflict, is known as *labile* or *stable* equilibrium. See *Conflict*.

F.N.

Grammar can be understood as the *linguistic competence* of the speaker of a natural language (q.v.), and in particular as a regulative system by which relations are established

between particular sound systems (see *Phonemics*), sound sequences (see *Morphemics*), rules of syntax (rules for forming sentences), and the associated meanings of sound sequences (see *Semantics*).

Every theory of grammar must try to account for the fact that a competent language user can understand, or produce in a way intelligible to others, an unlimited number of sentences never before heard. The principles that enable sentences of unlimited number or length to be assembled from a finite repertoire of elements and rules are known as *recursive rules*.

Structural description provides data on the constituents of sentences, their interrelation and sequence (*phrase-structure rules*), and on the grammatical information needed for interpreting sentences. Various grammatical models exist for structural description, e.g. *generative (transformational) grammar* (Chomsky, 1957, 1965, 1968), whose analysis in accordance with "immediate constituents" (first level: e.g. subject-predicate), or analysis by means of "transformational rules" (or rules for re-ordering and recombining sentence constituents), is concerned with the generative properties of the *basic* or *deep structure* which corresponds to the "meaning", or fundamental semantic relations, of the sentence. Actual utterances can assume other, at times more complicated, structures (*surface structure*, or structural relations between elements of a sentence) which can be formed in linguistic analysis from the basic structure by using transformational rules to re-order the fundamental constituents. In speech (q.v.) surface structures undergo phonological interpretation and are expressed phonetically (see *Phonemics*). (For the analysis of deep structure, see Chomsky, 1965.)

Language acquisition (grammar acquisition) is explained variously. The empiricist view (e.g. Skinner, 1957) is that language is mastered exclusively by *learning*. Rationalist-nativist theories (e.g. Chomsky, 1968; Chomsky & Halle, 1968) assume that language

acquisition also depends on specific *predispositions*. The speed with which basic rules are derived and applied in ontogeny from pre-existing language, suggests the existence of preformed (possibly universal) formal principles of grammatical structuralization. Analyses of spoken language appear to show that linguistic competence, e.g. between the ages of 24 and 29 months (age of two- and three-word utterances), draws on only a few grammatical classes which are embodied in simple hierarchic rules:

$$S_1 \rightarrow N + N$$

$$S_2 \rightarrow P + N$$

$$S_3 \rightarrow P + NP$$

$$NP \rightarrow \{P_N\} + N$$

N = noun

P = pivot word class (containing adjectives and modifiers)

NP = noun complex

$\begin{Bmatrix} X \\ Y \end{Bmatrix}$ = either X or Y

These rules correspond to the *basic*, or *deep*, structures of adult competence. Derived, transposed structures do not yet make their appearance. Children thus seem to begin their *grammatical development* with the syntactical forms immediately associated with semantic interpretation. From the behaviorist point of view it might be expected instead that the child would first learn from the surface structures used by adults (see Braine, 1963; Brown & Bellugi, 1964; Brown & Hanlon, 1970; Miller & McNeill, 1969).

This use of Chomsky's notion of competence is criticized on the ground that it takes account only of what is systematic in speech, of *grammaticality* (q.v.), and not of the context in which utterances are made. For the competence value that verbal utterances acquire through their position in the verbal and situational context, Campbell & Wales (1970) would like to substitute "communicative competence". Consequently, the observational basis of the speech acquisition theory of McNeill (1968) also appears to

be inadequate, as it includes no situational parameter. Other reasons could be adduced for the fact that children do not at first make use of any "derived" sentence structures. Brown & Hanlon (1970) try to incorporate the communicative milieu in the observation of speech development, in order to find out whether speech acquisition is partly determined by specific selections of the child from the supply of information available to it (see also Bernstein, 1961, 1965; Brown, 1965; Irwin, 1960). See *Language; Psycholinguistics; Speech; Verbal behavior; Concept*.
Bibliography: Bernstein, B.: Social class and linguistic development: a theory of social learning. In: Halsey, A. H. *et al.* (Eds): Education, economy and society. New York, 1961. Id.: A socio-linguistic approach to social learning. In: Gould, J. (Ed.): Penguin survey of the social sciences. Harmondsworth, 1965. Braine, M. D. S.: The ontogeny of English phrase structure: the first phrase. *Language*, 1963, 39, 1-13. Brown, R.: Social psychology. New York, 1965. Brown, R. & Bellugi, U.: Three processes in the child's acquisition of syntax. *Harv. educ. Rev.*, 1964, 34, 133-51. Brown, R. & Hanlon, C.: Derivational complexity and order of acquisition in child speech. In: Hays, J. R. (Ed.): Cognition and the development of language. New York, 1970. Campbell, R. & Wales, R.: The study of language acquisition. In: Lyons, J. (Ed.): New horizons in linguistics. Harmondsworth, 1970. Chomsky, N.: Syntactic structures. The Hague, 1957. Id.: A review of B. F. Skinner's verbal behavior. *Language*, 1959, 35, 26-58. Id.: Aspects of the theory of syntax. Cambridge, Mass., 1965. Id.: Language and mind. New York, 1968. Chomsky, N. & Miller, G. A.: Introduction to the formal analysis of natural languages. In: Luce, R. D., Bush, R. R. & Galanter, E. (Eds): Handbook of mathematical psychology, Vol. 2. New York, 1963. Chomsky, N. & Halle, M.: The sound pattern of English. New York, 1968. Irwin, O. C.: Language and communication. In: Mussen, P. H. (Ed.): Handbook of research methods in child development. New York, 1960. McNeill, D.: Developmental psycholinguistics. In: Smith, F. & Miller, G. A. (Eds): The genesis of language. Cambridge, Mass., 1968. Miller, G. A. & McNeill, D.: Psycholinguistics. In: Lindzey, G. & Aronson, E. (Eds): Handbook of social psychology, Vol. III. Reading, Mass., 1969. Skinner, B. F.: Verbal behavior. New York, 1957.

W. Abraham

Grammaticality. A language structure is grammatically correct when grammar (q.v.)

allows it a structural description. This presupposes that this structure can also be interpreted semantically, and if so, that the possibility of so interpreting an utterance (i.e. pragmatically) need not of itself imply proficient grammatical form. The boundary line between "correct" grammar (grammaticality) and deviant grammar (caused by sociological and redundancy factors—obvious errors where the context is situatively adequate) is a fluid one. A further distinction must be made between grammaticality and *acceptability*.

Bibliography: Halliday, M. A. K.: Categories of the theory of grammar. Word, 1961, 17, 241–92. Jespersen, O.: Philosophy of grammar. London, 1924. Leech, G. N.: English in advertising. London, 1966. Palmer, F.: Grammar. Harmondsworth, 1971. Sebeok, T. A. (Ed.): Style in language. Cambridge, Mass., 1960. Warburg, J. F.: The best-chosen English. London, 1961. *Id.*: Verbal values. London, 1966. *W.A.*

Grandeur, delusion of. A false belief which qualifies as a delusion, that the person has a social position or ancestors of importance and renown, or great wealth, possessions, abilities or powers. *B.B.*

Grand mal. Major epileptic attack. Clinically subdivided into pre-convulsive, convulsive and post-convulsive phases. The first is characterized by prodromes (premonitory symptoms) which may take the form of irritability, moodiness, tension, or minor attacks. Alongside these general symptoms are frequently found peculiar sensations which immediately precede the onset of the fit, and to which the term *aura* is applied. This is the patient's last experience, generally accompanied by acute anxiety, before unconsciousness sets in. The seizure itself consists first of a tonic contraction, then of a clonic (tumultuous) spasm which, though usually symmetrical, can take a variety of forms. In the post-convulsive phase the patient remains for some minutes in a profound coma (q.v.). This is followed by a deep sleep

lasting a few hours, in some cases by a state of semi-consciousness. The attack is followed by amnesia in regard to the entire event. The spasms can be recorded objectively by EEG (electroencephalogram, q.v.) observation of correlative electrical currents developed by the cerebral cortex. Even between attacks there are often typical indications. So far there has been no satisfactory explanation for the onset of an epileptic fit. It may be assumed that in a general way all CNS substance is spasm-prone, and that in epilepsy the normal properties of the CNS are present on an exaggerated scale. Treatment consists largely in the administration of CNS-depressant drugs. To a limited extent, recourse may be had to stereotactic (q.v.) methods, which also often have a favorable effect on the attendant psychic behavior, e.g. aggressiveness, moodiness, and so on.

Bibliography: Janz, D.: Die Epilepsien. Spezielle Pathologie und Therapie. Stuttgart, 1969. Penfield, W. & Jasper, H.: Epilepsy and the functional anatomy of the human brain. Boston, 1954. *M.Ad.*

Graph. A series of points joined by a line, which is the edge of the graph. Graphs are used to represent the structure of a system. A graph is finite if it has a finite number of edges and points. A graph usually shows a variable as it varies in comparison with one or more other variables. *P.-B.H.*

Graphic representation. The pictorial delineation of a numerical result. *W.H.B.*

Graphology. I. 1. Terminology; concept. "Graphology" is a technical term from the Greek *graphein* = to write, and *logos* = account. The word was first used by Abbé Jean-Hippolyte Michon, and is to be found in his *Système de graphologie* (1875). More recently, the expression "psychology of handwriting" has been used with the same meaning. In

the U.S.A., usage varies between "grapho-analysis" and "handwriting analysis". Graphology claims to be a scientific diagnostic method for learning about the writer's personality from his handwriting. In contrast to most "psycho-technical" tests, graphology attempts to apprehend the whole personality and not merely individual characteristics. It is not itself a science, but a scientific aid in psychological diagnosis. The graphologist must be trained in psychological characterology and have some knowledge of psychiatry and neurology.

Graphology uses handwriting as its objective starting-point. No two people write in exactly the same way.

Writing represents motor activity. As such, it resembles mimicry in being a movement of the body, an individual expression (q.v.) of the personality (q.v.) in movement which writing fixes. Writing is learnt in school according to "national" models. And yet, even in the lowest class, exercise books reveal great individual differences in writing, although the collective "national" pattern may remain recognizable. It is the task of graphology to discover what each person's handwriting expresses. Some claim that inherited characteristics and those acquired later on can be recognized, and usually differentiated. Everyone's handwriting changes as he grows older and his personality develops. This is due in part to the constitution of his body and brain. A graphologist requires little equipment: an ordinary magnifying-glass and a rule are sufficient. A framed fluorescent screen can also be useful, and the work may be facilitated if a good projector is available.

In addition to establishing the details of the handwriting by analysis, a graphological diagnosis of character structure requires the use of an irrational factor—intuition (q.v.) or empathy. It is indispensable, as in all productive scientific work which is more than a mere collection of facts; however, it cannot alone justify any claim to be a science or support the reliability (q.v.) of graphology, which has been suggested in many experi-

mental studies. Anyone who sets out to interpret handwriting by using only intuition or particularly keen "extrasensory perception" may have some success (R. Schermann), but his work can hardly be called graphology. An analytical approach must be combined with a synthetic picture of the whole, if the task is to be solved and sources of error are to be avoided.

2. *Historical survey.* By nature all people share, and indeed cannot do without, a direct understanding of what is expressed in all living movement. For that reason there was, even in antiquity, a non-scientific (or *pre-scientific*) interpretation of handwriting (e.g. Suetonius in the second century A.D.; in China since A.D. 1000). The first systematic approach dates from the Italian doctor C. Baldi (1622). But not until 150 years later did the Swiss pastor J. C. Lavater (1741–1801) in his *Physiognomische Fragmente zur Beförderung der Menschenkenntnis und Menschenliebe* (1775–81), make the decisive advance which was to lead to a more thorough systematic treatment of the subject. His own interpretations, however, owed too much to surmise, intuition and impression, and were often wide of the mark. But his work was widely read and proved a source of inspiration to others, especially in France (Abbé Flandrin). About a hundred years later Abbé Michon (1806–8) laid the foundations of modern graphology. He had no psychology to work on. His interpretative method was exclusively the study of individual characteristics (*signes*) of handwriting specimens. Precisely this apparent simplicity of approach awakened an almost passionate but superficial interest in large numbers of people in the nineteenth century. More responsible scientists soon attacked this frivolity. In France, for instance, J. Crépieux-Jamin (1858–1940) taught that many character traits cannot be directly established from simple graphological signs, but must be seen as combining several characteristics ("resultant theory"). Similar work was carried out in Germany by the doctors W. Preyer,

G. Meyer, etc., and above all the chemist L. Klages (1872–1956). Through his own discoveries and ideas, and those of his predecessors, he succeeded in raising graphology to a higher level. He recognized that *all handwriting characteristics had many meanings*. He sought a justifiable standpoint from which they could be judged and thought it could be found in studying the impression produced by the whole complex expression of handwriting, which he called “form level”. The difficulty and relative unreliability of a study based solely on intuition caused others to split up, refine and simplify his basic concept of “form level”. R. Wieser introduced the very important concept of “basic rhythm” into graphology. The Swiss M. Pulver (1889–1962), like E. Flatow-Worms and A. Mendelsohn-Teillard, introduced fundamentally psychoanalytic elements into the interpretation of handwriting. In place of “form level”, as used by Klages, he endeavors to reach an integrative standpoint by the use of intuitive understanding (*Wesensschau*). Important and promising progress was made in the work of R. Pophal, Professor of Graphology at the university of Hamburg. He relates handwriting to physiological cerebral types. In so doing he creates the possibility of justifying and enriching by psychosomatic study graphological findings about personality.

3. *The present state of graphology.* At present, graphological work in the main follows the lines taken by Klages (1956), Wieser (1969) and Pophal (1965, etc.). Both mental and physiological factors are considered. Most recently, influenced by the quantifying approach of Anglo-American psychology, there has been a counter-current known as graphometry (T. Wallner, G. Gruenewald). In its practical training of graphologists, the Zürich Graphological Institute recognizes the particular significance of a psychological foundation. Graphology is also taught at some German and Dutch universities as a branch of academic psychology. A number of associations in Germany, Switzerland, Hol-

land and Italy, some of them representing rival views, seek to further the progress of graphology by their teaching and by publishing journals.

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R. R. Pokorny

II. *Recent developments.* The more recent trend in graphological research is seen in the endeavor to do away with the confusion of pathognomy and graphology for which L. Klages and others were responsible, and to assign graphology as a diagnostic discipline to *psychodiagnostics* and not to the psychology of expression. The endeavor to objectify graphology and give it a statistical justification may be approved, if one considers the limitations of graphological diagnosis (J. P. Guilford called graphology a “useless method”; see also Müller & Enskat (1965, 562). Writing can lose its authenticity because of external factors. Other errors can be caused by inaccurate appraisal, ambiguity of characteristics, personal prejudice and systems of reference of the particular graphologist. See Allport & Vernon, 1933; Wells, 1946.

The critical justification and analysis of the basis of graphology are concerned with two sets of problems:

1. Checking the basic hypotheses (axioms) of graphological diagnostics, e.g. that the individuality of the handwriting is in essence psychologically conditioned, and that it is possible to draw conclusions from handwriting about the psyche of the writer. See *Graphology I*.

2. Studying the basic problems of the interpretation of handwriting: objectivity (q.v.), reliability (q.v.) and validity (q.v.). Graphometry, which Groffmann (1960) called the basic discipline of graphology, deals with this problem; up to now it has succeeded in objectifying the recording of graphic characteristics (more than 80 variables), grouping these with the aid of factor analysis (q.v.), and using correlational statistics to check them for stability, reliability and validity. Work in this field has so far been published by Timm (1967), Fahrenberg & Conrad (1965), Fischer (1964), Wallner (1963, 1965) and others.

The abovementioned authors all agree in the preliminary finding that, while there are quite *significant* correlations between certain characteristics found in handwriting and certain mental traits, these are nevertheless so slight that a more *critical* use of graphology is called for and that it can scarcely be recommended as the *sole test* method. This finding is largely confirmed by Eysenck's experimental work (1945, 1948). Eysenck confirmed the supposition that a personality diagnosis (e.g. of neuroticism, q.v.) is possible on the basis of a handwriting analysis (correlations with objective tests were low but significant, $v = 21$; with the psychiatric assessment, $r = 02$), but is nevertheless too time-consuming in view of the low level of accuracy. A diagnosis of intelligence with the aid of graphology hardly seems useful (Michel, 1969). A judgment on personality based on handwriting alone can rarely be justified since such fundamental dimensions as extraversion-introversion cannot be accurately diagnosed; control, irritability, etc., being the only components which can be elicited with relative certainty (Timm, 1967).

Bibliography: Allport, G. W. & Vernon, P. E.: Studies in expressive movements. New York, 1933. Eysenck, H. J.: Graphological analysis and psychiatry: an experimental study. Brit. J. Psychol., 1945, 35, 70-81. Id.: Neuroticism and handwriting. J. Abnorm. Psychol., 1948, 43, 94-6. Fahrenberg, J. & Conrad, W.: Eine explorative Faktorenanalyse graphometrischer und psychometrischer Daten. Z. exp. angew. Psychol.,

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F. Novak

Grasp; grasping. 1. To stretch out one's hand; a series of (purposive) simple movements of the hand and arm to grasp an object (see *Time and motion study*). 2. Way in which an object is grasped, e.g. with the finger tips or the whole hand (see *Handedness; Manual dexterity; Work-factor system*). 3. To understand something.

Bibliography: Mausolf, A.: Der Weg zum richtigen Griff. Berlin-Cologne-Frankfurt, 1969. G.M.

Grasping reflex (syn. *Palmar response; Tonic grasping reflex*). A baby grasps objects which touch the hollow of its hand. The energy expended is such that the baby can be lifted up. This involuntary reflex can normally be easily demonstrated in the first two months of life, after which it then gradually begins to disappear with the increasing myelinization of the voluntary motor pathways. If the intensity of the grasp increases after the third month, or if the reflex persists longer than the fourth, it is regarded as pathological.

Bibliography: Halverson, H. M.: Studies of the grasping responses of early infancy. J. Genet. Psychol., 1937, 51, 371-449. K.H.P.

Grasping stage (syn. *Near space stage*). A baby begins to grasp objects at about the age

of five to six months and this activity is the first indication that it is becoming aware of space. The child is now learning to control by motor maneuvers the small area within its grasp. Hence this phase of its development has been called the grasping stage or "near space stage" (Bühler). During this period visual and tactile space are combined; afterwards the visual component gradually predominates.

Bibliography: Bühler, K.: The mental development of the child. New York & London, 1930. *M.Sa.*

Gratification. See *Depth psychology*.

Graves' disease. See *Basedow's disease*.

Gravimeter. Appliance for testing sensitivity to weights. The testee has to lift and give an estimate of various weights which look alike but are not all equally heavy.

A.Th.

Gravity chronometer. A device used in the last century for measuring reaction time by the distance travelled by a falling weight between the time of the stimulus and the time of the response. Superseded today by precise electronic timers.

G.D.W.

Graz school. See *Austrian school*.

Gregariousness. See *Sociability*.

Grey scale. The series of achromatic neutral colors lying between white and black. The different gradations of the scale are represented by elements between which there is a constant difference of brightness.

G.Ka.

Ground; Figure-ground problem. This concerns the laws of perception which E. Rubin

(1921) was the first to study systematically in the field of optics. The question why a part of the entire field takes over the role of ground, and another part that of figure, and when and why figure-ground distributions constantly vary, were investigated by W. Ehrenstein, K. Koffka, M. Metzger (in particular). See *Figure-ground*.

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Group. Groups are not distinguished by fundamentally changing laws. There is no empirical justification for such a supposition, nor would it fit in with a general group theory.

A *typological* approach classifies groups according to their changing combinations of *characteristics* which can be identified operationally, such as, for example, size, density of interpersonal activity (cohesiveness), degree of formalization of roles (institutionalization); they can also be classified according to their goals: e.g. socio-emotional (R. Bales, 1953) (leisure), achievement or performance (work groups), religious, social, or racial groups, or special forms such as therapeutic groups. This mode of classification is also found in group concepts, represented by *polarities* such as big-small, institutional-autonomous, casual-lasting, etc. In spite of such differences, however, they are subject to comparable laws.

Some group concepts have proved especially useful. A genetic criterion is employed to distinguish the *primary* group (C. Cooley, 1909) from the *secondary*. The *primary* group, usually the family, is necessarily, and by the mere fact of its existence, a face-to-face group, i.e. it acts through the direct physical contact of the members. It provides the first personality-formative social experiences, impressions (see *Imprinting*), and learning processes (see *Socialization*). The *secondary* group can also result from direct contact, and is usually only one among several to which an individual belongs (school, club, work team). *Formal groups* are regulated by

laws and institutions. *Informal groups* owe their continued existence to voluntary, personal and emotional relations. They are not mutually exclusive, but complementary (E. Mayo, 1933; F. Roethlisberger; W. Dickson, 1939). The concept of the *reference group* (H. Hyman, 1942) implies the identification of the individual with the standards and objects of some group. It is not necessarily identical with *membership group*; if there is agreement, the reference group is also the "ingroup"; otherwise, as an "outgroup", it is often the occasion of conflicts.

Bibliography: Cartwright, D. & Zander, A.: *Group dynamics*. New York, 1960. Secord, P. & Backman, C.: *Social psychology*. New York, 1964. P.B.

Group dynamics. An important object of psychological theory and practice in social, industrial, and occupational psychology (q.v.), psychotherapy (q.v.), and educational psychology (q.v.). Lewin (1936) used the term "group dynamics" to denote this field. The theory deals with groups of two or three (marriage), with educational, work or leisure groups, and with larger units such as schools, factories or military structures. It is also applied in sociology, educational and political theory, etc.

Group dynamics is *basically related to the socio-cultural context of a society* (q.v.), which helps the individual and a possible group to come together by providing given patterns of feeling, evaluating, thinking and acting. Such correspondences between the demands of the individual and the dynamic activity of the group are among the group-forming factors. They are primary determinants of reciprocal dynamic interaction between individuals who create and regulate social structures. Necessary though insufficient conditions of this kind are "*spatial proximity*" (L. Festinger, S. Schachter & K. Back, 1950) and a certain "*minimum of contacts*" (Homans, 1950; M. Sherif, 1951, 1953). In addition to external opportunities, there must be an *internal agreement* among

the individuals forming the group, which transcends the above mentioned socio-cultural norms. C. B. Broderick (1956) formulated the following variables: (a) the nature of the area of agreement, (b) the degree of agreement, (c) the importance of the area of agreement, (d) the extent and number of the areas of agreement. Similarities in values and norms ("similarity of orientations") (Newcomb, 1943, 1956, 1961), and affinities of attitudes and personality traits ("similarity of attitudes") (H. M. Richardson, 1939; Winch, 1958) are reasons why certain persons are preferred to others as partners. In addition, special abilities related to the group's goals as well as intelligence increase eligibility (M. E. Bonney, 1944; B. Grossmann, J. Wrighter, 1948). Opposites, too, according to the theory of "complementary needs" (Winch & Ktsanes, 1955), favor relationships between individuals when, for example, needs felt by both are reciprocally gratified in the interaction. Secord & Backmann (1964) have combined the aspects of agreement and contrast to formulate the theory that the person is selected who will help to maintain a congruence (continuity, confirmation) of existing attitudes. The "exchange theory" (J. W. Thibaut & H. Kelley, 1959; Homans, 1961) emphasizes the outcome of cost and reward in relationships between individuals.

Groups persist when the primary conditions responsible for the grouping become a *more stable, positive interpersonal attraction*. The attraction is the measure of *group cohesiveness*, which finds expression in the frequency of contacts and the emotional and rational closeness of interpersonal relationships. *Equilibrium theories*, for example, are concerned with such processes. That of F. Helder (1946, 1958) states that in a triangular constellation of two persons who are concerned with some common object there will be a balance when (a) all three relationship values are positive, or (b) two of them are negative. But groups are determined not only by relationships between

individuals but by those between dynamic processes. According to a thesis put forward by Bales (1953), group cohesion disintegrates when there are *activities in the field of performance*, whereas it increases when there is *co-operation in the socio-emotional field*.

Group cohesiveness and the structure of interpersonal relationships can be represented quantitatively as well as by graphs; this is done by using the methods of sociometry (q.v.) (J. Moreno, 1953). The so-called Q technique makes it possible to calculate a cohesiveness quotient (Hofstätter, 1965), and the measurement of "social distance" (E. S. Bogardus, 1928) throws light on efforts to establish a similar scale.

In addition to the relatively stable structure of social bonds, group dynamics determines fundamentally the actions of group members. Festinger's (1951) theory of "cognitive dissonance" (q.v.) states that activities begin when, in the cognitive field (perception, imagination, memory, thought), a decision has to be taken in regard to two simultaneous, incompatible elements (e.g. discordant items of information, irreconcilable standards). The cooperative interactions thus provoked, such as orienting behavior (gathering information, discussion), judgments and decisions, planning, differentiation of roles, checking, and actions to restructure the situation within and without, are included in the concept of "*problem-solving*" (q.v.) behavior, which culminates in the goal of the *self-preservation* of the group. There are two main phases in this process: (a) *the analysis of the situation* (consideration of group relationships, with feedback control of goal-attainment, etc.); and (b) *organizing and concluding a appropriate performance*. Observation (in the laboratory or the social field) is an example of the analytical processes. Bales (1950) suggests a list of observational categories for analyzing group processes: (a) the socio-emotional field: (i) positive: e.g. release of tension, (ii) negative: e.g. shows antagonism; (b) task area: (i) questions: e.g. asks for suggestions, (ii) answers: e.g. gives information.

The analysis of group dynamic processes is of central importance in group therapy (q.v.). Interpersonal relationships are discussed or represented in dramatic form, and it is hoped that as a result social behavior will be clarified and adjusted (J. Moreno, 1953). This method has also been successful in improving the emotional elements of interaction in group learning (Brocher, 1967).

Group leadership uses methods which vary from the autocratic model to the integrative sessions directed by the group itself, in which appropriate problems are put forward for discussion. Studies designed to elucidate the connection between leadership variables (conceived as direction or education), and modifications of behavior in the group, were reported by Lewin, Lippitt & White in 1939, and recently by Tausch & Tausch (1970). Changes in group dynamics brought about by these different kinds of *leadership* (q.v.) apply to the fields of *achievement*, *performance*, *social behavior* and *personality traits*. In spite of initial difficulties of method (determining operationally valid rating categories, practicability, and authenticity of various styles of leadership, etc.), a satisfactory uniformity was achieved in the results. The autocratic (authoritarian) style of leadership is distinguished from the socially integrative (democratic) kind by the degree of *direction and emotional aloofness* involved. The *laissez-faire* style was also examined later. As contrasted with the autocratic (authoritarian) style, the socially-integrative style brings about the following changes: (a) *achievement*: the amount remains the same or decreases slightly; the quality improves distinctly, becomes more creative, there is greater variety, greater keenness and independence in tackling the work; (b) *social behavior*: the atmosphere among group members becomes more friendly, there is less tension and aggression, more mutual appreciation, a more natural relationship with the leader is established; after six months the group members show more adaptability.

Research into leadership characteristics

has dealt with the connection between *personality and leader behavior*. In a survey of the literature (1948), Stogdill found a consensus regarding: intelligence, scholarship, reliability, sense of responsibility, activity and social sympathy (see *Leader*). Hofstätter (1957), referring also to Carter & Nixon (1949), reports three factors: competence, individual distinction, and group sociability. The leader's involvement in the group is shown in the concept of the "leadership function", which expresses group effectiveness in terms of the set goal. Krech *et al.* (1962) mention the following as functions of leadership: executive, planning, expertise, external group representation, control, reward and punishment, arbitration, example (image), ideology, etc. The specialist's role suggests that a leader's functions can also be exercised by non-leaders. In this case, leadership function and group function coincide. This type stresses the integrative running of the group by the group itself according to the criterion of self-preservation (e.g. the cybernetic growth model: Deutsch, 1949; Mills, 1969). A prominent group function is the improvement in quality of the interaction taking place in the group as, for example, success with contacts. A. Bavelas (1951) and D. D. Barrett (1951) took groups of five for examination as networks of contacts, and examined them from the point of view of possible contacts, and the importance of a central position for mediation between partners; they considered these groups as (a) a circle, (b) a chain, (c) a star. In the "circle", speed and accuracy of work are on a low level, but on a high level in the "chain" and the "star". In the "circle", the organization of contacts is unstable; it is more stable in the "chain", and unmistakable in the "star". Partner satisfaction is greatest in the "circle", less in the "chain", and least in the "star". The results depend on the nature of the activity. The degree of freedom of action which the group possesses, and which is related to organization, is a variable of the power relationships.

Power is manifested in very varying degrees

of intensity, which may be visible or subliminal. M. Sherif (1935), using the term "autokinetic phenomenon" (q.v.), showed that individual judgment tends clearly to converge with group judgments when the individual judging is aware in advance of the others' assessments. S. E. Asch (1956) specified the following conditions for conformity of judgment: (a) the nature of the stimulus situation, e.g. its structural clarity; (b) the nature of the group forces, e.g., unanimity; (c) characteristics of the individual, e.g. social behavior. A more rational factor of conformity is the degree of knowledge possessed about the object of judgment. Hence those who wield power commonly resort to censorship, or the "slanting" or suppression of information. Moral defamation can also be a means of exercising power, as can sanctions and corporal punishment. Direct manifestations of power can easily lead to a state of affairs where a split or dissociation is apparent, as, e.g. on the one hand a popular leader, and on the other a leader in the field of action and authority (Hofstätter, 1965). This probably also applies to the hierarchy of motives. The exploitation of constraint to ensure group conformity, and the use of moral stereotypes and mass media, frequently combined with irrelevant appeals to the emotions, constitute some of the more subtle techniques for exerting influence, as do certain forms of propaganda and publicity. But group behavior is not always the outcome of a multiplicity and hierarchy of different goals open to the group. Situational stress (q.v.) is tolerated in order to allow achievement of more important and distant goals, which may be impracticable goals which have only been promised; if the stressful situation lasts too long, the price is not infrequently mental disorder.

The exercise of power shows that the relations between the claims of the individual and the group or society have become *one-sided*, and have resulted in displacement toward a single individual, or toward society. This unilaterality leads to conflicts and

confrontations (not always immediately but, in time, inevitably), which can only be avoided by exchanging members. It disturbs the autonomous development of the natural forces at work in social structures. According to internal and external conditions, the group is either an *instrument for misuse* to gratify individual or social demands, or else an admirable means to develop and maintain mature individuals in beneficial interaction with society. Such is the danger and such the opportunity offered by group dynamics. In a positive sense it favors an (active) agreement between: (a) individual desires which cannot, or can only less easily, be gratified without the group; (b) demands and restrictions imposed by society on the individual, which are necessary in practice to achieve an equal distribution of the greatest benefits derivable from interaction.

Group dynamics is the essence of all problem-solving interaction processes which are developed by individuals conscious of relatively stable structures (e.g. norms, roles, attitudes, habits), and relatively changing forces (e.g. identified goals, cooperative actions, realization of drives, and motives) which may be subjective or standardized by society; the goal is to achieve continuous integrative development and the differentiation of social relationships. Group dynamics is not restricted to the internal working of a group; and it is not necessarily bound up with the concrete presence of a group; but the group is its primary location. See *Group formation; Attitude; Prejudice*.

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P. Braun

Group factor. The group factor model is a predecessor of the model of several common factors (see *Factor analysis*): apart from the general factor (q.v.), and the specific factors, there are also intermediate general factors—these are group factors. The best-known method of group factor analysis is Holzinger's "bifactor method".

W.H.B.

Group formation. A process in the course of which a group is formed from a plurality or a mere collection of individuals. Pre-requisites for the formation of groups are: (a) individual motivation for joining a group (it may be positive, facilitating the gratification of personal needs, or negative, providing a defense against some threat to the individual concerned); (b) communication or contact between individuals (facilitated by spatial proximity or insignificant social distance); (c) mutual recognition of individuals.

As a group comes into being, the following processes can be observed: common goals appear, roles are differentiated, and taken over by individual members; common rules of behavior and norms develop, with which the behavior of the individual members begins increasingly to conform; a certain group atmosphere or special climate is engendered; auto- and hetero-stereotypes develop, i.e. a positive estimation of one's own or "our" group with reference to its capabilities, the attractiveness of its members, etc., and a rejection or disparagement of the other or "those" groups. See *Group dynamics*.

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Group instruction. Group instruction is education in, through, and for the group. It is the primary method used in the democratic style of education. Pupils are activated not by tasks and suggestions coming from the teacher, but by impulses originating in the members of the group. Individual behavior is determined by what the group expects from the activity and how it evaluates it. The group-dynamic forces at work are dealt with in social psychology (q.v.).

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Group measurements. The term denotes either (a) the observation of a characteristic in some group (sample) with that characteristic, (b) the simultaneous measurement (testing) of a group of subjects (group experiment), or (c) the observation (quantification) of modes of behavior (performances, decisions, etc.) of a group in a socio-psychological experiment, in contrast to the modes of behavior of individuals in conditions which are otherwise similar. See *Correlational techniques*.

Group sexuality. This exists when there is equally privileged interaction of more than two persons with the goal of sexual pleasure. The activity of several directed at a single individual who responds preferentially could only be included under this head as an extreme case of sado-masochism. Promiscuity (q.v.) and the exchange of partners ("group sex") are distinct from group sexuality.

U.H.S.

Group tests. Tests which are constructed so that a fairly large number of testees can take them at the same time. The most varied tests, e.g. certain intelligence tests, tests of skills and abilities, and personality tests, have been developed as group tests. They are more economical to conduct and evaluate, and frequently more global in their results than individual tests.

E.F.-K.

Group therapy. Psychotherapeutic methods in which several patients (usually six to twelve, half of them where possible being male, the other half female) are treated in the presence of one (or possibly several) therapists using group dynamics (q.v.). The analytical group provides opportunities, both therapeutic and diagnostic, not available in the traditional analytical situation (patient alone with psychotherapist). "Closed" groups are usually maintained for a fairly long period, but sometimes "open" groups are formed (the members of which change more or less frequently). In addition to this analytical method, other group therapies are used by psychotherapists either selectively or exclusively; for example, directive-suggestive treatment could consist of autogenic training (q.v.), psychodrama (q.v.), music therapy (q.v.) and similar methods.

Physiotherapeutic methods used in a group often achieve particularly good results because the participants spur one another on. **Bibliography:** Battegay, D.: Der Mensch in der Gruppe, Vols 1-3. Berne & Stuttgart, 1968-9. Foulkes, S. H.: Therapeutic group analysis. London, 1964. Id. & Anthony, E. J.: Group psychotherapy:

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Jones, M.: Social psychiatry. London, 1952. *Id.:*
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H.N.G.

Group work. 1. In industrial theory: the direct co-operation of several workers whose efforts are interdependent in the joint execution of some task. **2. In education:** a method in which a given subject is not dealt with directly by the teacher standing in front of the class but by the pupils in small groups (a transition from authoritative to co-operative leadership) (see *Leadership*). Especially a form of university teaching in small tutorial or seminar groups. It has been opined that methods used in universities for lectures and discussions will be used later in public life for negotiations, speeches and conferences.
G.Ma.

GSR. Abb. for *Galvanic skin response* (q.v.).

Guilford factors. In regard to temperament, these are fifteen primary characteristics isolated by factorial analysis from data taken from inventories; they are not wholly independent; systematized by Guilford using three areas of behavior (general, emotional, social), and five basic polar dimensions (positive-negative, controlled-uncontrolled, active-passive, etc.). For example: immaturity-maturity, confidence-inferiority, social introversion-extraversion, etc. See *Traits*.

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H.H.

Guilford-Zimmermann Aptitude Survey. A test battery for intellectual aptitudes, with separate tests for verbal comprehension, general reasoning, numerical operations, perceptual speed, spatial orientation, spatial visualization and mechanical knowledge. Devised 1947-56; standardized for testees from the age of sixteen.

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R.M.

Guilford-Zimmermann Temperament Survey. On the basis of extensive factor analyses Guilford & Zimmermann produced a questionnaire for personality assessment in which the following independent characteristics are measured with thirty items each: general activity, restraint, ascendance, emotional stability, sociability, objectivity, friendliness, thoughtfulness, personal relations, masculinity. Prepared and standardized for college students and adults.
R.M.

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Guilt. One can speak of guilt as *culpability* only on the assumption that such a thing is ascertainable in human beings within certain fixed limits. The concept and nature of guilt, when not restricted to the empirical psychological or psychopathological phenomenon of a consciousness, feeling, or sense of guilt (a subjective awareness of having offended against personal, familial, religious, or societal norms, which offense may be actual or imaginary), are defined according to philosophical anthropology, ethics and the law.

"Man is the being that is capable of guilt, and capable of perceiving his guilt" (M. Buber). The capability of guilt, or moral responsibility, implies that an individual is capable of free self-determination, responsible behavior, and the assumption of responsibility. The notion of a criminal law basing its conception of criminal responsibility on the criterion of voluntary action implies the freedom of will of the "normal" citizen as a principle. "Freedom" in this sense (as a prerequisite for all legal codes) is not the freedom that philosophers of the most varied

schools have been unable to agree upon throughout the centuries. The fact that, e.g., a "normal" citizen "can" stop when the traffic light shows red, that it is impossible for him to "have to" ignore the stop signal, is assumed to be an adequate ground for postulating the "freedom" of a citizen as an inevitable and scientifically unassailable prerequisite for every legal code. Admittedly, the citizen's behavior, considered as acceptable or unacceptable in regard to the flow of traffic, is causally and finally motivated—but in the same sense as any human behavior, decision or volition. As far as the confirmation of legal responsibility is concerned, it is immaterial whether one views freedom of will as a metaphysical premiss or as an ontological prerequisite. What is in question is always no more than the empirically detectable conditions for the possibility of unfreedom. The legal code lays down the conditions beforehand in its requirement of *understanding* of the nature of an action, or of the difference between right and wrong. A psychiatrist to whom a case is referred for assessment of understanding of right or wrong, or of normality, may try to assess the determinants of the subject's behavior by physical and psychological examination and tests, even with particular reference to the action in question, but inevitably in regard to the social and criminal prognosis. Ultimately, the procedure he adopts must always be empirical. Existing ethical and legal norms permit social evaluation of a specific behavior, and to that extent form the yardstick for guilt. Ethical and legal norms enable one to confirm that a behavior does not accord with the norm. The question of *why?*, of the conditions for the abnormal behavior, is on another plane, and has to be answered by means of empirical, biological and psychological criteria. Hence, in most English-speaking countries, clinical psychologists and/or psychiatrists are hampered by the obtaining socio-legal norm. For example, the so-called McNaughten rules (which date back to a successful plea of insanity in Britain

in 1843) directly involve the notions of free will, intent and moral responsibility, and, basically, hold an individual to be responsible for his socially criminal action (e.g. murder), unless he suffered from defective reason or mental disease such as to impair his understanding of the nature, quality or wrongness of the act he committed. Essentially, the law does not provide for refinements of psychological theory or evidence essentially contrary to the basic notion of free will. See also *Abnormal psychology; Alcoholism; Conscience; Criminality; Forensic psychology; Mental defect; Punishment.*

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H. Ehrhardt

Guthrie's contiguous conditioning. See *Post-remity theory*.

Gynagogy. Schaetzing uses the term for psychagogy as specially designed for the gynecologist during consulting hours.

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W. Sch.

Gynandromorph. An abnormal individual with some tissues genetically and structurally male, and others genetically and structurally female, as can occur through disturbance of the sex determination mechanism during

embryonic development. See *Intersexuality*; *Hermaphroditism*. G.D.W.

Gynandromorphism. A type of sexual aberration in which both male and female characters are present in the same organism. The cause in man is either genetic, because of an excess of X chromosomes, or secondary, because of some psychic disorder (see *Transvestism*); in the latter case those affected try to acquire a female shape by taking female sex hormones (*apparent hermaphroditism*). Occasionally, but not necessarily, found together with homosexuality (q.v.). W.Sc.

Gynandry. The tendency in a female to possess male characteristics. (*Viraginity*: the tendency for a female to exhibit masculine mental characteristics.) The parallel condition in males, i.e. possessing female characteristics, is called *androgyny*. G.D.W.

Gynecocracy. See *Matriarchy*.

Gynecomastia. The formation of one or two breasts in a man (a *gynecomast*); in special circumstances there may be secretion of milk. It is not a disease but a symptom which has widely differing causes. The following need to be distinguished: (a) Puberal gynecomastia is

a normal, non-morbid variant of maturation between the ages of twelve and fourteen; there is swelling of one or both mammary glands, and while this is usually transient, it can be irreversible and require an operation; occasionally puberal gynecomastia is accompanied by negative psychic effects. (b) Gynecomastia resulting from hormone therapy (e.g. testosterone therapy in cancer of the prostate gland). (c) Gynecomastia as a symptom of disease of the endocrine glandular system (e.g. estrogen-producing tumors of the adrenal glands or testicles). (d) Gynecomastia as a symptom of congenital intersexual conditions (real and apparent hermaphroditism). (e) Gynecomastia as a concomitant symptom in non-endocrine diseases (e.g. cirrhosis of the liver).

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Gyrus. The *gyri cerebri* (cerebral convolutions) are irregularly shaped folds 1 cm. in width and several cm. in length, separated by the cerebral fissures or *sulci cerebri*. Special terms denote position: e.g. *gyrus temporalis medius*. Some gyri have an important functional significance, as for example the *gyrus frontalis inferior*, area 44, which coordinates the muscles used in speech and is therefore known as the motor speech center (*Broca's area*, q.v.). G.A.

H

Haab's pupillary reflex. An ideomotor or cortical pupillary reflex (q.v.): the contraction of the pupils of both eyes when looking at a bright object in a darkened room. *K.H.P.*

Habit. The term "habit" derives from the Latin noun *habitus*, from the verb *habere*, to have. Modern dictionaries describe at least four usages, all referring to the characteristic external appearance, manner or bearing by which we may recognize an individual or class of individual: human, animal or plant. Thus one special usage refers to dress or attire, especially in relation to religious orders and other functional groups. More relevant to the present context is the usage referring to the customs or practices characteristic of a social group. Closest, however, to the technical usage within psychology is the use of the word to refer to an individual's tendency to act in customary or automatic ways, especially when these are acquired by practice or experience.

Even in this last sense, the term is used in popular language in a variety of ways. It covers many different forms of behavior, including the following:

(a) Mechanical, semi-automatic series of movements involved in routine actions such as dressing oneself.

(b) Actions related to recurrent acquired physiological cravings, e.g. the "habit" of smoking.

(c) Mannerisms such as "tics" and other "nervous habits".

(d) Characteristic modes and manners of speech.

(e) Characteristic ways of thinking as reflected in predictable points of view and attitudes expressed about issues and events.

(f) Actions evaluated on ethical grounds by others, or by society in general; that is, "good" or "bad" habits such as acts of courtesy, stealing or swearing, distinctive of an individual.

The term is also used loosely and in many different ways by psychologists. It may refer to molecular aspects of behavior such as a specific measurable component of a simple conditioned reflex or an acquired association between a pair of words, or to very broad molar patterns of behavior extended over considerable periods of time. In either case, the reactions are predictable or customary. Emphasis may be placed on the actual behavior evoked by a certain set of conditions, or on the underlying "set", disposition or readiness to respond in this way to those conditions. Habits may be seen as possessing autonomous motivating properties or as requiring appropriate motivational states for their activation. Invariably, however, habit is contrasted with pre-programmed innate reflexes or instinctual reactions in that one essential characteristic of a habit is that it is acquired, an end-product of a process of learning. Hence, an acceptable general definition of habit might be: *A customary pattern of behavioral, cognitive or emotional response, predictable according to the conditions operating at the time of response, and acquired by a process of learning or the underlying acquired*

"set" or tendency toward that pattern of response.

1. *History.* Historically, the modern concept of habit stems from Descartes's (1596–1650) dualistic view of body and mind and his insistence on the mechanical nature of bodily events. Habit, for him, was a consequence of the easing, through usage, of the passage of "animal spirits" through the pores of the hydraulic system he proposed as a model of physiological functioning. Next, in the doctrine of association (q.v.), the English empiricist philosophers provided a central principle for a psychology of learning and placed fruitful emphasis on the importance of sensory processes. Hobbes (1588–1679) claimed that all our ideas stem from sensory experience and that association depends upon the coherence of these ideas. John Locke (1632–1704) took Hobbes's arguments further with his famous and bold assertion that the mind at birth is a "*tabula rasa*". He explained the apparent given quality of many of our ideas by the early inculcation of habits through the teaching of nurses, parents and other mentors. Hume's (1711–1776) entire philosophical system was based on the association of ideas. For him, all perceptions and experiences, even belief in relationships of cause and effect, were explained by habits established by consistencies between experiences. Habit was his universal law of mind.

The biological observations and writings of Charles Darwin (1809–1882) and, in particular, his emphasis on the adaptive nature of behavior, represent the next major relevant influence. In his *Origin of Species* (1859) Darwin discusses the effects of domestication upon animals, especially the resultant suppression of "natural instincts". While recognizing that deliberate selective breeding plays a part, he also argues that imposed habits become fixed reflexes which are then transmitted by genetic mechanisms. Later (1872) Darwin employs similar arguments to account for the acquisition of expressive characteristics from originally voluntary movements

subserving practical functions. (See *Expression; Instinct.*)

These trends of thought culminated in William James's (1842–1910) brilliant exposition of psychology as an empirical science in his *Principles of Psychology* (1890). His thinking was dominated by concepts of biological utility, and he saw the function of consciousness (q.v.) as steering a highly evolved and therefore complex but plastic nervous system. James (q.v.) devotes a celebrated chapter to habit. Increased neural plasticity, it is argued, facilitates the establishment of habits whose major function is to allow the performance of routine actions with little or no attention, thus freeing the higher mental processes for more important and difficult tasks. Habit, according to James, is "the enormous fly-wheel of society, its most precious conservative agent". At the same time, James did not deny the importance and biological utility of instinctive, unlearned behavior patterns, but saw them merely as providing the opportunity for progressive, adaptive modification in the light of experience. Thus instincts become overlaid by habits which ultimately replace them. Modern views do not deviate greatly from this doctrine but phenomena such as *imprinting* (q.v.), much studied in animal species by contemporary ethologists, suggest that the relationship between instinctual and learned behavior may sometimes be of a different and equal nature. By imprinting is meant the firm linkage of an innate tendency to a specific environmental object at a critical period in the early life history of the organism, and the generalization of this linkage to other objects of the same class.

Neuro-anatomical and physiological knowledge was sufficiently advanced when James was writing for him to postulate that the neural basis of habit-formation might be the establishment of "connections" to form fixed neural "pathways" in the central nervous system (q.v.). This was an early stage in the still-continuing search for a "memory-trace". James envisaged complex pathways of this

nature such that, in the execution of a complex habitual act, each new muscular contraction is instigated by the sensation evoked by the preceding contraction. Such a system would now be described as a "chain-reflex". Unfortunately, this attractively simple account of habit-formation has not survived experimental tests. Even the simplest of motor-habits do not preserve an identical form: the same strategic end may be achieved by a variety of tactical means. Similarly, ablation (q.v.) experiments demonstrate quite clearly that the preservation of a habit does not depend upon the integrity of any particular region of the brain.

Dewey and other members of the American "functionalist" school, following similar Darwinist arguments, acquired views on habit-formation very close to those of James. At about the same time, Thorndike (q.v.) (1898) was carrying out his classic experiments upon trial and error learning in which hungry cats, over a series of trials, gradually acquired the ability rapidly to unlatch the door of their specially designed "puzzle-box" cages in order to secure food placed outside. Thorndike made the point that repetition alone was insufficient to account for his findings. There is also a process of selection among the acts performed so as to increase the likelihood of those acts which yielded access to the food and resulted (so Thorndike postulated) in a state of satisfaction, and decrease the likelihood of those acts which resulted in dissatisfaction. This principle is now known as the *Law of Effect* and the rewards and punishments affecting the process of learning are now generally referred to as *reinforcements*. The Law of Effect has been subjected to much criticism but it remains clear, as argued forcibly by Skinner (1938) and his followers, who describe this type of learning as *operant conditioning* (q.v.), that behavior is modified according to its consequences, and that appropriate reinforcement is an important factor in habit formation. The recent discovery by Olds & Milner (1954) of reinforcing effects produced by electrical

stimulation of the septal area of the brain suggests a neuro-physiological basis for this process.

Of equal importance to the work of Thorndike were Pavlov's (1927) investigations into the nature of *conditioned reflexes*. He showed that if a neutral stimulus, such as the sound of a bell, is presented at a very brief interval before a natural or *unconditioned stimulus* (e.g. food), evoking a natural or *unconditioned reflex* (salivation), and this pairing is repeated a number of times, presentation of the sound alone (now a *conditioned stimulus*) will evoke salivation. The latter *conditioned reflex* is qualitatively and quantitatively different from the original unconditioned response and therefore no simple stimulus-substitution theory is tenable. All the evidence points to the anticipatory nature of the conditioned reflex, and therefore suggests that what is learned is an expectancy with clear biological adaptive value. Pavlov was a physiologist, and interested in the light his experiment threw on brain functioning. He was opposed to attempts made by contemporary psychologists to build an entire systematic theory of learning upon his work. Nevertheless, J. B. Watson (q.v.) (1919), the founder of *behaviorism* (q.v.), established an entire system of psychology on this basis. For him, habits were integrated systems of conditioned reflexes built around available innate patterns of movement. Language habits were special cases in that, to some extent, speech could become "implicit", implicit speech being the behaviorist equivalent of thought. Personality, even, was considered to be merely the end-product of hierarchical habit-systems. Man was set apart from other animals only by his greater capacity for developing three of these habit-systems: laryngeal or verbal habits; manual habits; visceral or emotional habits. (See *Conditioning, classical and operant*.)

2. *Recent views.* Despite the cult-like excesses of some of Watson's arguments, a modified behaviorism has remained prominent throughout the recent history of

psychology and has yielded valuable research findings. Particularly important among the contributions of the neo-behaviorists in relation to the concept of habit are the work and theory of C. L. Hull (q.v.) (1943). He laid stress on the distinction between the actual performance of a learned act and the internalized tendency to perform the act when appropriately stimulated. He reserved the term "habit" for the latter. Those consistencies in behavior which indicate learning are only observable in appropriate stimulus conditions which may recur at long intervals. Hull inferred that some theoretically observable modification of the central nervous system, some form of "memory-trace", remains potentially active during the interval. Thus Hull's habit concept has the status of a *hypothetical construct*. It is also an *intervening variable* in his formal theory in which *habit strength* (S H R) represents the compounded effects of various antecedent variables such as the number of reinforced trials, and interacts with other intervening variables such as *drive* (D) to determine a *reaction potential* (S E R). Hence, in his quasi-mathematical presentation of the theory, Hull's fundamental equation is:

$$S E R = f(S H R) \times (D)$$

This equation was further elaborated to include intervening variables representing inhibitory and other factors, but represents, as it stands, the important distinction drawn by Hull between learned habit and performance, and his view that the habit must be energized by a drive state in the presence of appropriate stimulation if an actual response is to occur.

Skinner and his co-workers are atheoretical in their approach to learning, restricting themselves entirely to observable relationships between observable events. This is entirely adequate for their aim of developing a behavioral technology, but Hull's argument concerning a modified state of the organism which persists between learning trials remains valid. Other learning theorists

have elaborated aspects of Hullian theory, e.g. Spence (1956), while others, notably Tolman (1938) with his "purposive behaviorism", have presented alternative systems, stressing cognitive factors. Yet others, such as Osgood (1953), attempt to reconcile these two points of view by postulating cognitive mediating processes within a Hullian framework. All these refer to habit formation of one type or another, based on acquired associative relationships between one stimulus and another, or between stimuli and responses, brought about by appropriate conditions of contiguity and/or reinforcement. The same principles can be extended to account for higher forms of learning, such as concept learning, but the application of the term "habit" to these realms is a matter of choice. Motives can also be acquired in these ways, and there is evidence to suggest that any well-established habit can become functionally autonomous and acquire motivational properties such that the opportunity for its exercise can be used to reinforce new learning. (See *Motivation*.)

Current research and theory take many directions. One of great interest and importance is the search for a physical basis for the "memory-trace". Interesting and influential, if speculative, suggestions concerning the development of complex functional interconnections between cerebral neurons were advanced by Hebb (1949). Recently, however, considerable interest has been aroused and research stimulated by Hyden's (1959) suggestion that ribonucleic acid (RNA) might be a complex chemical mediator for memory functions. The exciting possibilities raised by the location of a "pleasure center" in the brain have already been mentioned. This is likely to give strength to already emerging hedonistic theories. The strategic context within which habits operate has also been mentioned. Miller, Galanter & Pribram's (1960) theoretical account of "plans and the structure of behavior" promises new advances in this area. (See *Memory*.)

Finally, the topic of habits should not be

left without mention of the application of planned re-educational habit-formation and habit-breaking by means of counter-conditioning carried out by the behavior therapists, and by behavior modifiers working in the field of clinical psychology (Eysenck, 1960; Ullmann and Krasner, 1965). (See *Aversion therapy*; *Behavior therapy*.)

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G. Jones

Habitat. An ecological term: the entire geographical environment of an organism (species; plant or animal), possibly at a certain stage in its development. The habitat consists of inanimate (biotope) and animate environmental factors. See *Biocenosis*. H.S.

Habitual. 1. Pertaining to, or of the nature of a *habit* (q.v.). 2. Established by habit. 3. Customary, regular, lasting. Pertaining to that which remains relatively the same over fairly long periods of time (e.g. *traits*, q.v.) in contrast to, e.g., states. D.B.

Hair esthesiometer. A hair (from human or horse) used as a fine tactile stimulus in the study of cutaneous sensation. One classical experiment is supposed to demonstrate that different points on the surface of the skin are sensitive to heat, cold, pain and pressure respectively, so that stimulation with a fine point will result in one or other of these four experiences depending upon the exact locus at which the stimulus is applied. G.D.W.

Half-length illusion. The phenomenon that the subjective and objective mid-points of a line do not coincide. This illusion occurs in both vision and touch. See *Kundt's bisection test*. C.D.F.

Hall, Granville Stanley. B. 1844 in Ashfield (Mass.); d. 1924, Worcester (Mass.). After graduating from Williams College, he studied theology at Union Theological Seminary in New York, and went on to read physiology, physics, theology and philosophy in Bonn and Berlin; he was the first person to obtain a degree in psychology proper in the USA with his doctoral thesis on "The Muscular Perception of Space" (1878). He then again studied physiology in Berlin and was Wundt's first American student in Leipzig. He also worked with Helmholtz in Berlin. He became a lecturer in 1881, and in 1884 was appointed Professor of psychology and pedagogics at Johns Hopkins University. In 1888 he became the first President of the newly-founded Clark University in Worcester, and held this post until 1920, when he resigned.

Hall was the first great organizer of

American psychology and made a substantial contribution to the expansion of psychology in the USA. In 1884 he founded what was probably the first American psychological laboratory—at Johns Hopkins University. In 1887 he established the first American journal of psychology (*American Journal of Psychology*), followed by the *Pedagogical Seminary* (later the *Journal of Genetic Psychology*) in 1891, the *Journal of Religious Psychology* in 1904, and the *Journal of Applied Psychology* in 1917. In July 1892 he was instrumental in founding the American Psychological Association (APA) of which he was the first President. In 1893, he established the National Association for the Study of the Child to foster research into child psychology.

Hall also made a major contribution to the advancement of psychoanalysis (q.v.) in America. In 1909 he invited Freud and Jung to the USA and arranged a symposium at Clark University during which he introduced leading American psychologists to the European giants.

The theory of evolution is fundamental to Hall's work. His interest in evolution was great enough to earn him the title of "Darwin of the mind". He applied, for example, the "recapitulation theory" to child development, i.e. he assumed that the individual in his ontogenetic development passes through the same stages of development as the race as a whole in its phylogenetic development ("ontogeny recapitulates phylogeny"). Hall's interest in evolution led him to consider in great detail problems of child and developmental psychology. His studies, in which he made use of Galton's questionnaire method, aroused considerable public interest and led to the "child study" movement. In addition, they played a decisive role in the development of educational psychology (q.v.), which investigates the psychological bases of child education. (See *Child psychology; History of psychology*.)

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W.W.

Hallucinations. Perceptions without corresponding external stimuli, or the absence of perception when external stimuli are presented (*negative* hallucinations). Depending on the type of sensory illusion, there are: *olfactory*, *visual* or *acoustic* hallucinations. As regards etiology, the spectrum ranges from organic psychoses (frequently with elementary hallucinations), by way of exceptional psychogenic conditions, to schizophrenia (q.v.). See *Mental imagery; Psychoses, functional*.

A.Hi.

Hallucinogens. See *Psychotomimetic Drugs*.

Halo effect. A source of error in personality assessment first described by F. L. Wells (1907) and given its name by Thorndike (1920). The observer (e.g. a teacher) tends to be guided by an overall impression or an outstanding trait in rating an individual.

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H.Ma.

Haloperidol (*Haldol; Serenase*). The most important minor tranquilizer of the butyrophenone type (neuroleptic group). Haloperidol has a strong neuroleptic action and

often has dyskinetic extrapyramidal effects in high doses. In psychological studies of healthy individuals performance and general sensation of well-being were improved rather than impaired with doses of up to 2 mg, but alcohol reinforced negative effects. See *Differential psychopharmacology*.

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Halving method. In psychophysics, a method for constructing a ratio scale of subjective magnitude. The subject is required to judge when a stimulus is perceptually half the value of a previously presented standard on the dimension being scaled, without knowledge of the relevant physical values: e.g. for scaling perceived brightness, S. is required to indicate when he thinks a variable light is half as bright as the standard (or to adjust it to this position himself). This procedure is repeated for many points along the physical scale until a stable ratio scale of subjective magnitude is achieved. G.D.W.

Hand. The “universal tool”, an important human organ of sensation (tactile, pressure, temperature, vibratory and pain sensations), expression, communication (sign and finger language, writing), and contact (touching, stroking, gripping). Man’s development into his present advanced form would have been impossible without the hand; this is reflected in the expression “*homo faber*”. Industrial psychology and occupational psychology study the use of the hand in work (manual skills, motor skills, etc.)

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Handedness. A spontaneous or acquired preference for using the right or left hand, associated with corresponding differences in dexterity. The dominance of the right hand corresponds—due to the intersection of the (motor) pyramidal pathways in the medulla or in the particular spinal-cord segments—to a dominance of the left half of the brain, and vice versa. Handedness, which Greene’s studies (1943) show to be a special factor in the psychomotor system, can be determined in the simplest instance by questions, or tests such as throwing a ball, pointing, etc. See *Laterality; Motor skills*.

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M.A.

Handicapped children. The psychological and educational problems of handicapped children include on the one hand the child’s difficulty in reconciling himself with his obtrusiveness in his habitual surroundings, and his impaired physical movement, and on the other hand attempts to induce in the child, despite his handicap, a positive development of personality. Care for handicapped children concentrates on strengthening self-reliance, avoiding a succession of failures, and bringing about a positive mental attitude to the handicap. See *Child psychology; Mental defect*. H.Schr.

Handicapped person. An individual with innate or acquired impairment of physical function. But the term is sometimes used for the mentally, rather than the physically handicapped. See *Mental defect; Rehabilitation*. G.R.W.M.

Handlines. These lines appear on the palm of the hand and generally form an M-shaped

pattern; they are studied in chirolology (q.v.). A distinction must be made between the handlines and the papillary lines; fingerprints are taken from the papillary lines on the finger tips (dactyloscopy). The handline patterns of the palm and the lines on the sole of the foot are attracting growing attention in medicine, anthropology and genetics, and also to some extent in psychology (constitutional psychology). Chromosomal anomalies affect both the handline patterns and the psyche.

Bibliography: Penrose, L. S.: Dermatoglyphics. Scientific American, 1969, 22 (6), 72-84. *F.Ki*

Handwriting. See *Graphology*.

Haploid. By contrast with diploid (q.v.) and polyploid cells, haploid cells contain only one simple chromosome set. *Polyploid* = containing more than two chromosome sets (e.g. many cultivated plants). All the sex cells are haploid, as are many *protozoa*, lower plants and mosses. *H.S.*

Haploscope. Apparatus constructed by H. Hering for his experiments in binocular vision. The haploscope consists of two cylindrical tubes, the axes of which coincide with the line of vision of both eyes. In contrast to experiments with the *stereoscope* (q.v.), those using the haploscope are aimed not at creating effects in depth but at determining retinal orientation ratios. See *Identical retinal points*. *F.Ma.*

Haptics; haptic illusions. Haptics is the science relating to cutaneous sensation: that is, the modality of touch. There are many different types of sense organ in the skin, including receptors for pressure, temperature and pain. An example of a haptic illusion is Aristotle's illusion, in which two fingers are crossed and a small object is placed between them. Two

objects are perceived since the skin on the outside of the two fingers is stimulated: normally this would result from two objects. Many of the visual illusions, e.g. *Müller-Lyer* and *tau effect*, also occur in the touch modality. *C.D.F.*

Harmonic. 1. An *overtone*, or upper partial, with a wave vibration frequency which is an integral multiple of that of the fundamental. 2. Capable of expression in sine or cosine functions. 3. (syn. *harmonical*; *harmonious*) Congruous, agreeable, pleasing.

Harmonic mean (*H*). An expression for the central tendency of a distribution: the reciprocal of the arithmetic mean of the reciprocals of a sample (series of values).

$$H = \frac{1}{\frac{1}{N} \sum \frac{1}{X_i}} = \frac{N}{\sum \frac{1}{X_i}}$$

for discrete variables, and:

$$H = \frac{1}{\int_{-\infty}^{\infty} \frac{f(x)}{x} dx}$$

for continuous variables. In the case of positive *x* values, *H* is smaller than the geometric mean or arithmetic mean.

W.H.B.

Hashish. Cannabis (q.v.) resin: the strongest of the hemp products used as euphoriant. Hashish is normally smoked but may also be eaten. The use of hashish and other cannabis derivatives such as marihuana (q.v.) has risen constantly in recent years, especially among young people. According to Bewley (1968) consumption in England rose more than 700% in the years 1960 to 1965. The widely held opinion that persons who are labile or show other psychological anomalies are the main users of hashish could not be confirmed by Lennertz (1970) in a questionnaire study of young hashish smokers. The latter differed from a control group in their

high level of tolerance, which Lennertz believes to be connected with the entire social and moral outlook of this group.

Few controlled studies have been made of the psychological effects of hashish. Evaluation of the effects is complicated by the fact that the pharmacological effectiveness of hashish varies widely while the effects are also dependent on individual experience with the substance and on the technique of smoking. In normal doses inexperienced testees generally note no subjective changes when hashish is taken, while the experienced persons report slightly euphoriant and stimulating effects. The performance of naïve testees tended to be impaired, whereas experienced marihuana smokers reported improved performance in some cases.

Hallucinogenic effects (primarily visual hallucinations linked with real perceptual objects) only occur with high doses or chronic use. See *Drug dependence; Psychotomimetic drugs*.

Bibliography: Bewley, T. H.: Recent changes in the pattern of drug abuse in London and in the United Kingdom. In: C. W. A. Wilson (Ed.): *Adolescent drug dependence*. Proceedings of the Society for the Study of Addiction. Oxford, 1968, 197-220. Jones, R. T. & Stone, G. C.: Psychological studies of marijuana and alcohol in man. *Psychopharmacologia*, 1970, 18, 108-17. Lennertz, E.: Zur Frage der antisozialen Persönlichkeit jugendlicher Hashischraucher. *Z. für Sozialpsychol.*, 1970, 1, 48-56. Weil, A. T., Zinberg, N. E. & Nelson, J. M.: Clinical and psychological effects of marihuana in man. *Science*, 1968, 162, 1234-42. G.E.

Haunt. House or other locale that has become the scene of apparitions (q.v.) or similar manifestations associated with former inhabitants since deceased. J.B.

Hawthorne experiments. Generic name for a series of experiments to analyze the conditions of industrial output, starting with purely physiological and going on to psychological and sociological questions. The experiments were organized in 1927-32 under E. Mayo

and his colleagues T. N. Whitehead, F. J. Roethlisberger, W. J. Dickson, *et al.*, in the Hawthorne Works of the Western Electric Company.

The first series of experiments (first and second Relay Assembly Test Room, Mica Splitting Test Room) showed no clear correlation between productivity and the controlled variables, i.e. wage system and general working conditions. The results of the Mass Interviewing Program (starting in 1928) led to experimental studies of human relations in the Bank Wiring Observation Room (1931-32) and to the discovery of the "informal group" (q.v.) and its significance in determining individual productivity.

Bibliography: Argyle, M.: The relay assembly test room in retrospect. *Occ. Psychol.*, 1963, 27, 98-103. Roethlisberger, F. J. & Dickson, W. J.: *Management and the worker*, Cambridge, Mass., 1939.

W.F.N.

Hearing. See *Auditory perception; Sense organs*.

Hearing, localized. The localization of sound depends on the difference in time taken by the sound to reach the two ears (see *Differential running time*). Because of this, localization of sound sources lying in a vertical plane at right angles to, and in the middle of, a line joining the two ears is very poor, since from all points in this plane the sound will reach both ears at the same time. C.D.F.

Heart beat (syn. *Heart rate*). The number of heart beats per minute. The normal value is 60 per minute. Various regulating mechanisms allow the rate to rise during physical activity (greater volume of blood supplied to the heart) up to a possible maximum of 220 beats per minute. The heart rate is determined by measuring the pulse or ECG impulses per minute (cardiochronograph, cardiograph, electrocardiograph, etc.). Recording of heart rhythms is an important

part of any examination of circulatory function, and enables conclusions to be drawn on the functional condition of the heart. The rate is faster in abnormal metabolic conditions (Basedow's disease, q.v.), and slower in the case of trained athletes.

E.D.

Hebb's theory of perceptual learning. Hebb's theory (see *Attention*) that (mature) learning is dependent on interacting central neural organizations, or "cell assemblies", which form the neural basis of complex, enduring patterns required for, e.g., concept formation. The structure by which individual assemblies are related to one another is called a "phase sequence". Practice builds up these highly coordinated groups of cells in the cerebral cortex.

Bibliography: Hebb, D. O.: The organization of behavior: a neuropsychological theory. New York, 1949. Id.: A neuropsychological theory. In: Koch, S. (Ed.): Psychology: a study of a science. New York, 1959, 622-43.

Hebephilia. An abnormally passionate interest in adolescents.

Hebephrenia. One of the schizophrenic syndromes. Originally described by Hecker in 1871 as an illness of puberty which led to a silly deterioration of intellect. Hence it was similar to *dementia praecox* (q.v.) and was grouped with it by Kraepelin in 1893. The syndrome is characterized by youthful onset, affective symptoms of blunting with lability, silliness, inappropriateness, irritability, thought disorder and disturbances of volition. Poorly organized delusions and hallucinations are usually present, but motor symptoms are not. The onset is insidious and the prognosis poor.

B.B.

Hedonism. The theory that sensual pleasure is the sole objective of all behavior. Today

hedonism is mainly considered in psychoanalysis (q.v.) (the *pleasure principle*). In ethics, hedonism is contrasted or combined with *eudaemonism*, according to which the desire for happiness is the end of all (right) action.

Bibliography: James, W.: The principles of psychology, Vol. 2. New York, 1890.

M.R.

Height disparity. See *Horizontal disparity*.

Helmholtz, Hermann von. *Life and works.* B. 31/8/1821 in Potsdam; d. 8/9/1894 in Charlottenburg, Berlin. Graduated in 1842 with a study of the origin of nerve fibers in the ganglionic cells. He then worked as an army surgeon in Potsdam. In 1847 he read his famous paper to the Physical Society of Berlin on the principle of the conservation of energy. In 1849, Helmholtz became Professor of physiology in Königsberg, where he remained until 1855. Between 1855 and 1858 he was Professor of anatomy and physiology in Bonn, and then Professor of physiology in Heidelberg until 1871. In 1871 he was appointed Professor of physics at Berlin University, and in 1887 he was appointed first Director of the newly established Imperial Institute of Physics and Technology in Charlottenburg (Berlin).

Helmholtz published more than two hundred articles and monographs in which he made a fundamental contribution to anatomy, medicine, physiology, physics and psychology. In the psychological sphere, his work on the physiology and psychology of sensation is of most interest. By far his most important works are the three volumes of his *Treatise on Physiological Optics* (1856-1867) and his study of the *Theory of Sensations of Tone as the Physiological Basis of the Theory of Music* (1862). In the first work he presents his own findings and offers a survey of the German literature on the anatomical, physiological and physical bases of visual perception; the second study contains his

contribution to physiological acoustics, and in particular to the study of problems of the auditory discrimination of timbre and pitch.

Physiological psychology. Helmholtz's first important work in this sphere was the determination of the transmission velocity of nervous excitation in the sensory and motor nerve fibers (i.e. the speed of the neural impulse) by examining the "nerve-muscle preparation" of frogs and carrying out reaction-time experiments on humans. He refuted the previously held opinion that the speed of conduction in the nerve is many times greater than the speed of light. In the sphere of optics and sensory physiology Helmholtz invented the ophthalmoscope, and the ophthalmometer—a device to determine the corneal curvature of the eye. Working independently of the Dutch physiologist Cramer, Helmholtz reached the same conclusions in his description and explanation of the process of accommodation (q.v.) in the eye. In his theory of color perception he developed the view of the British physiologist T. Young. Starting from the law of specific energy of nerves (Müller), Helmholtz assumed the existence of three color-sensitive nerve substances whose excitation leads in each case to a specific color sensation (red, green, blue), while all the other color sensations are obtained by mixing these three primary colors.

Helmholtz's assumptions on space perception (q.v.) and object perception are based on Lotze's local sign theory, which he tried to harmonize with Müller's principle of specific energies. He believed that perception is a two-stage process. The basis of perception is represented by the sensations, whose quality and intensity are inborn, and which are conditioned by specific characteristics of the sense organs. Sensations themselves, however, have no significance for space and object perception but are merely "signs", which only acquire significance in the course of development by association through experience. The acquisition of meaning consists, in Helmholtz's opinion, of judgment

processes which may be conscious to begin with but become automatic after repeated association—as "unconscious inferences" which, because of their compulsive character, appear as evident perceptions. Helmholtz adopted a distinctly empirical standpoint in the empiricism vs. nativism debate in perception theory (see *Perception*).

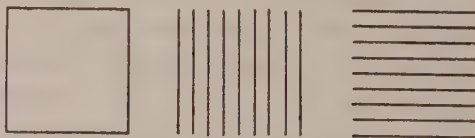
As regards audition (see *Auditory perception*), Helmholtz acquired importance primarily through his resonance theory (q.v.), in which he explained, e.g., the discrimination of pitch by assuming that the variously long fibers in the basilar membrane of the inner ear are made to vibrate by wavelengths corresponding to their natural frequency: i.e. the different hair cells vibrate in tune with the sound wave frequencies.

Main works: Treatise on physiological optics, 3 vols. Ed. J. P. C. Southall. Rochester, N.Y., 1924–5. On the rate of transmission of the nerve impulse. In: Dennis, W. (Ed.): Readings in the history of psychology. New York, 1948, 197–8. On the sensations of tone. New York, 1954.

Bibliography: Boring, E. G.: A history of experimental psychology. New York, 1950. Gruber, H. & V.: Hermann von Helmholtz: nineteenth century polymorph. Sci. Mon, 1956, 83, 92–9. Lenzen, V. F.: Helmholtz's theory of knowledge. In: Montague, M. F. A. (Ed.): Studies and essays in the history of science and learning. New York, 1946, 299–320. McKendrick, J. G.: Hermann von Helmholtz. London, 1899. Müller, J.: Elements of physiology. London, 1837–42. Warren, R. M. & R. P.: Helmholtz on perception: its physiology and development. New York, 1968. Young, T.: Miscellaneous works. London, 1855.

W.W.

Helmholtz squares. This illusion principally demonstrates the effect whereby filled spaces



look larger than empty spaces, for the two squares composed of many parallel lines appear to have a larger surface area than the

one consisting of a simple outline. However, the ends of the parallel lines give the illusion of straight edges not actually drawn so that the figure also provides an example of *closure*.
C.D.F.

Helson-Judd effect. See *Adaptation level*.

Hemeralop[s]ia (syn. *Night-blindness*). A defect of vision at night or in twilight caused by partial or complete absence of scotopic rod vision. It may be an innate and recessive (in some case also a dominant) inherited characteristic (Trendelenburg, 1961), but is generally acquired through an alimentary deficiency of vitamin A, which is necessary for synthesis of the retinal rod pigment rhodopsin (q.v.).

Bibliography: Trendelenburg, W.: *Der Gesichtssinn*. Berlin, 1961.
K.H.P.

Hemianopsia (syn. *Hemiopia*). Failure of the visual field on one side, which may occur in lesions of the central optical pathways between the intersection of the optic nerves (*chiasma opticum*) and the occipital lobe. Depending on the location of the lesion, hemianopsia may be homonymous (on the same side), or heteronymous (e.g. bitemporal), complete or incomplete.
C.S.

Hemiparesis. Unilateral (motor or sensory), incomplete paralysis due to failure of the central nervous centers or pathways. Since these paths intersect, the lesion is situated on the side opposite the diseased side.
C.S.

Hemiplegia. Paralysis of one side of the body generally caused by a stroke (see *Hemiparesis*).

Hemispheres. The two halves of the cerebrum (right and left cerebral hemispheres), which are joined together by the *corpus callosum*.
C.S.

Hereditary characterology. A trend in psychology which developed in the nineteen twenties with the object of determining the

degree to which character (q.v.) was inherited rather than dependent on environment (q.v.). The most reliable results came from twin studies (q.v.). See *Traits*.
W.K.

Heredity, theory of. A hypothesis based on C. Darwin's *Origin of Species* (see *Darwinism*), according to which all animal and plant species have developed by evolution (q.v.) from simpler organisms. This hypothesis also implies that today's wealth of species has developed by division of species from a few organisms and ultimately, perhaps, from a single species. The essentials of heredity theory are generally recognized nowadays by serious scientists, since all the evidence is in its favor, and no refutation is available.

H.S.

Hering, Ewald. *Life and works.* B. 5/8/1834 in Altgersdorf (Saxony); d. 27/1/1918 in Leipzig. Studied medicine in Leipzig where he was influenced by G. T. Weber and G. T. Fechner. After publishing his five-part work on space perception (q.v.), he was appointed Professor of physiology at Vienna University, where he took over C. Ludwig's post. Five years later he went to Prague as Z. Purkinje's successor, and after twenty-five years there he once again replaced C. Ludwig, this time as Professor of physiology in Leipzig.

Hering was a physiologist specializing in sensation who played a very important part as one of the pioneers of experimental physiological psychology. He was a contemporary of H. Helmholtz's (q.v.); the two shared similar interests but differed in their theoretical approaches, which led to constant controversy between them. Helmholtz was an empiricist and Hering a nativist. In his theory of space perception (published in his *Contributions to Physiology*, 1861-64), by stating that the capacity for space perception is innate and does not need to be learnt, Hering stood out against the opinion expressed by Helmholtz one year later in the third volume of *Treatise on Physiological Optics*.

Hering also differed from Helmholtz in the basis of his phenomenological studies. The observation and description of subjective, sensory experience were among his primary objectives. His nativist orientation and methodical, phenomenological approach had a strong influence on C. Stumpf, and above all on later gestalt psychology.

Hering also became important by reason of his famous theory of color vision, which was opposed to Helmholtz's three-color theory, Hering asserted that there were three color-sensitive substances in the retina (q.v.) (red/green—yellow/blue—black/white) which are in a constant state of dissimilation and assimilation, and that one of the two color sensations corresponds to each of these two processes in a substance. All possible color impressions were said to result from the combination of these fundamental colors.

Main works: Beiträge zur Physiologie, 5 vols., 1861–5, Die Lehre vom binokularen Sehen, 1868. Über das Gedächtnis als eine allgemeine Funktion der organisierten Materie, 1870. Grundzüge der Lehre vom Lichtsinn, 1920.

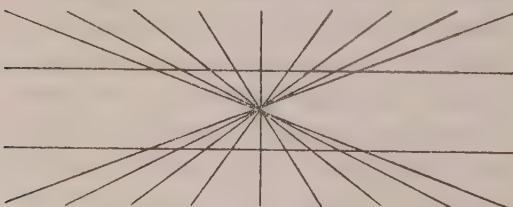
Bibliography: Boring, E. G.: Sensation and perception in the history of experimental psychology. New York, 1942. Hillebrand, F.: Ewald Hering. Leipzig, 1918.

W.W.

Hering fall test. A method for studying monocular and binocular vision in depth. In the simplest case, S. looks through a tube at a point of fixation on which the eye is focussed (see *Accommodation*). The experimenter drops small balls in front of and behind the point of fixation. S. is required to estimate the distance of the balls.

F.M.

Hering's illusion. One of the geometric



illusions. The two parallel horizontal lines are perceived as bending outwards.

C.D.F.

Hermaphrodite. An individual who has the physical characteristics (particularly sex organs) of both male and female. *Hermaphroditism* is extremely rare in humans, and only one set of sex organs is fully functional, but apparently a shift in dominance through either natural or artificial means is possible.

Hermaphroditism (syn. *Intersexuality*). Disturbed, incomplete physical sex differentiation, characterized by ambiguity or lack of agreement between external and/or internal sex characteristics (male/female). The causes of this abnormal development or malformation vary. Today a distinction is made between three principal forms of hermaphroditism: *pseudohermaphroditismus femininus* (female pseudohermaphroditism), *pseudohermaphroditismus masculinus* (male pseudohermaphroditism), and *hermaphroditismus verus* (genuine hermaphroditism). Whereas in the pseudohermaphroditisms, the genetic sex (chromosomal sex) coincides with the gonadic sex (i.e. either purely male or purely female), the external and internal sex organs are either hybrid (bisexual) or seem to belong to the other sex, in genuine hermaphroditism both sex-gland sexes are present (testicular and ovarian tissue), and the external and internal sex organs represent a mixture of male and female forms or, in external appearance, all stages from the male to the female type. The diagnosis "hermaphroditism" does not, therefore, necessarily involve specific external sex organs; the ambiguity may also be internal. The main problem of hermaphroditism lies in the psychological and psychopathological effects of the physical sexual development, above all from the angle of sex role identification and sex education.

1. *Pseudohermaphroditismus femininus*: genetically female individuals with internal

female sex organs (ovaries, fallopian tubes, uterus, vagina) and intersexual external genital organs, generally in the form of a greatly enlarged clitoris (clitoral hypertrophy), which may resemble a penis in appearance and size and is already visible at birth; the differentiation between the vagina and urethral opening is inadequate. Causes: usually a genetically conditioned overproduction of (masculinizing) androgens (q.v.); also known as the *andreno-genital syndrome* (AGS). Treatment consists in administering the hormone cortisol, which is not formed in the diseased adrenal gland. Money (1968) states early diagnosis is vital, ideally at birth. A girl can then grow up without ever knowing that she has had a special problem. The need for special sexual education is then correspondingly reduced.

2. *Pseudohermaphroditismus masculinus*: persons who are clearly male genetically and in gonadic sex; a distinction is made between two main groups, depending on the external appearance of the sex organs and the phenotype, i.e. (a) testicular feminization, as a relatively rare form in which the external genitalia and appearance are feminine—apart from the absence of pubic hair (hairless woman). Female development of the internal sex organs (uterus, ovaries, fallopian tubes) is not present, however. The genetic sex, sex glands and sex hormone production are male. Testicular feminization is not usually diagnosed until adolescence, when a doctor is consulted in the absence of menstrual bleeding. Cause: disturbance of all the androgen-dependent organs and tissues; clearly a hereditary defect by which the male hormones cannot influence the development of the sex organs either in the embryonic stage or in later life. Treatment: surgical extension of the vagina in or after puberty, and adequate psychological explanation of the cause of the condition and of infertility (Money, 1968). The main group of masculine pseudohermaphroditisms consists of (b) externally hybrid cases which come somewhere between the male and female pheno-

type, and which are difficult to distinguish externally from apparent female hermaphrodites. The true causes of these malformations cannot generally be explained in the individual case. Psychological and psychopathological problems are frequently encountered because (i) the external genitalia are ambiguous, and in extreme cases the patient himself has doubts about his sex role; (ii) in cases which are diagnosed at a late stage, sex characteristics may develop at puberty (e.g. breast development, absence of the secondary male sex characteristics) which do not correspond to the sex role to which the subject has become accustomed (e.g. male); (iii) certain genital malformations may prevent normal sexual behavior (failure of the erection mechanism), or make it more difficult, or alternatively—e.g. in *hypospadias scrotalis*—prevent sexually specific urination. For these and other reasons, an individual, medico-psychological treatment program must be prepared in each case of masculine hermaphroditism, as in the case of genuine hermaphroditism. There are certain basic criteria and rules for treatment (Wilkins, 1965; Money, 1968; Wallis, 1967).

3. *Genuine hermaphrodites*: the testicles and ovaries may be combined in a single organ (= ovotestes) or present separately (= lateral hermaphrodites) and both may reach fully functional maturity (sperm formation or ovulation and menstruation). The external and internal genitalia may present many different characteristics: all kinds of transitional forms from male to female types are possible (usually mixed forms). Genuine hermaphrodites may be genetically male-female or male or female (sex chromosomes XX or XY or XY/XO). Cause: probably due to disturbed nucleus division during early embryonic development. Occurrence: relatively rare. In all cases of hermaphroditism, early diagnosis is vital because medical treatment and adequate sexual education are dependent on it. The decisive factor in sexing a newly born hermaphrodite should be the anatomical appearance of the external

genitalia, even if the sex-gland sex and genetical sex do not coincide with it. Sex changes should be made at the earliest possible time (before the age of two years), and only if there is no clear phenotype. If hermaphroditism is diagnosed later on, i.e. after the fourth year of age, special medical and psychological treatment as defined by Wilkins (1965) and Money (1968) is indicated.

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H. Maisch

Heroin. A semi-synthetic morphine derivative (diacetylmorphine) with highly analgesic and euphoriant action (see *Analgesics*). With chronic use there is a risk of habituation in the sense of psychological and physiological dependence. See *Drug dependence*. G.E.

Hertz. A unit of wave frequency equivalent to one cycle per second, especially in electricity.

Heterogamete; homogamete. The male and female differ chromosomally. They are either homogametic or heterogametic from the standpoint of the sex chromosomes. Frequently, e.g. in man and in the fruit fly *drosophila*, the female sex is of the XX and the male of the XY type (heterogamete). Some butterflies, fishes and birds have heterogametic females and homogametic males; there is also the XO type, e.g. in bed bugs. Sex, however, is not determined solely by the ratio of X:Y chromosomes but by the ratio of the number of autosome sets to the number of X chromosomes. K.Fi.

Heterogeneous variance. The dissimilarity of two or more sample distributions is so marked that they probably do not originate from the same basic group. See *Variance, analysis of*. W.H.B.

Heterohypnosis. Generally referred to simply as *hypnosis* (q.v.): a hypnotic state brought about in a subject by the suggestive influence of another person (the hypnotist) (ant. *autohypnosis*, q.v. = self-hypnosis, i.e. a state of hypnosis brought about by autosuggestion, q.v.). H.-N.G.

Heterosensorial (syn. *Heterosensory*). From a different sense area. Ant. *homosensorial* = from the same sense area. E.g. heterosensorial association or reproduction. See *Homosensorial reproduction*.

Heterosexual. 1. Pertaining to sexual relationships with members of the opposite sex. 2. One who is sexually attracted to members of the opposite sex. In both cases, overt sexual behavior may or may not be involved, and the opposite is *homosexual*. G.D.W.

Heterosexuality, compulsive. Abnormally strong desire for heterosexual contact. Called *nymphomania* or *estromania* in females; *satyriasis*, *satyromania*, or *priapism* in males. Needless to say, the criteria for employing these diagnostic labels are ill-defined and arbitrary. G.D.W.

Heterostereotype. By analogy with the term as used in printing, the word *stereotype* (q.v.) denotes a relatively rigid concept of persons or groups which is resistant to change and usually simplified. *Heterostereotypes* are similar concepts of other persons or groups; *autostereotypes* are the ideas a person has of himself or of a reference, and/or membership,

group. Examples: heterostereotype: "miserly Scots"; autostereotype: "self-sacrificing scientist."

H.D.S.

Heterozygote. In a diploid (q.v.) cell, the two genes (see *Allele*) for a given feature may be identical, i.e. condition the same degree of emphasis of the feature, or different, in which case the emphasis of the feature will also differ. In the first instance, the cell or organism is said to be *homozygotic* in regard to the feature concerned, and in the second case *heterozygotic*. In heterozygotic organisms, the degree of emphasis of the feature is dependent on whether the latter is inherited by dominant-recessive or intermediary means.

H.S.

Hexis. A term used by Guilford (in his hierarchical model of personality) for the lowest plane of habit (q.v.). Hexis designates a constant disposition, which means that an individual behaves in a similar manner in a given range of situations.

G.K.

Hierarchy (syn. *Hierarchical structure*). 1. A ranking of elements (e.g. persons, things, concepts, constructs) so that each rank is subordinate to the next higher rank. The subordination may be based on widely varying factors (e.g. degree of generality, level of abstraction, dominance), but must remain the same within a hierarchical system. In personality (q.v.) psychology a number of attempts have been made to describe personality as a hierarchical system of, e.g., motives or traits (q.v.). In personality research based on factor analysis the distinction between first, second and higher order factors represents a hierarchical personality model. See *Motive*.

D.B.

2. Hierarchy of centers; hierarchy of moods. Behavioral structures are based on central coordination mechanisms with differing degrees of integration; the highest

levels have been defined by Tinbergen as *instincts*. Each instinct influences the motor units and competes with other instincts for control over the latter. Tinbergen assumes a linear arrangement of centers of different orders in the hierarchy of centers, ranging from the superimposed main instinct to the end action. With the exception of the highest center, the centers are generally blocked; the lower centers are charged by higher ones and must be disinhibited by key stimuli. In Baerends' hierarchy of moods, moods of differing order influence the duration of specific behavioral spectra. A specific stimulus situation does not always release the same behavior; the mood prevailing at a given time tends to be the decisive factor. Leyhausen's relative hierarchy of moods does not include a linear arrangement of moods in order of precedence. He assumes the appetite of the final action to be the dominant factor and not the last link in the chain. Cats, for example, do not have a uniform pre-catching impulse, but specific stimuli for lying in wait, creeping, pouncing, killing, etc. Each part action may become the desired final action, and suppress the others. See *Instinct*.

Bibliography: Baerends, G. P.: Fortpflanzungsverhalten und Orientierung der Grabwespe *Ammophila campestris*. Jur. Tijdschr. Entom., 1941, 84, 71-275. Leyhausen, P.: Über die Funktion der relativen Stimmungshierarchie. Z. Tierpsychol., 1965, 22, 412-94. Tinbergen, N.: The study of instinct. Oxford, 1969.

K.Fi.

Hierarchy, industrial. An historically conditioned form of authority with power distributed on several different levels and a strictly defined, permanent system of command and subordination. It is undecided to what extent there are tendencies toward elimination of the hierarchical structure as a result of technical progress (automation), and to what degree an approximation to "circular" (democratic) authority structures is possible. See *Industrial psychology*.

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Hillebrand's alley. An experimental technique for studying one aspect of the perception of three-dimensional space. Parallel lines, e.g. railway lines, appear to come together in the distance. Hillebrand constructed an alley of hanging threads and people were asked to adjust these until the two rows appeared parallel as they went into the distance. He could then measure the resulting discrepancies from true parallelism, thus discovering some of the properties of subjective space as opposed to objective space. C.D.F.

Hippocampus. A part of the temporal lobe which belongs to the hindbrain (see *Cerebrum*) and forms the medial wall of the inferior horn of the lateral ventricle. It consists of white and grey matter. Its functional significance has not been fully clarified; it is sometimes assumed to play a part in the ability to detect odors (olfactory processes), and sometimes to influence the function of the *formatio reticularis* (q.v.) and the development of conditioned responses. See *Neuroanatomy*. E.D.

Hippocratic types. The four *temperaments* (q.v.) wrongly attributed to the followers of Hippocrates and in fact described first in the Middle Ages. See *Type*. W.K.

Hirsutism. Abnormal growth of body hair in women (hair on the limbs, stomach, breasts; growth of a beard). Various causes: (a) heightened production (pathologically conditioned) of male sex hormones by the adrenal cortex (e.g. adrenogenital syndrome of female hermaphroditism, or Cushing's syndrome), or defective ovaries (e.g.

Stein-Leventhal syndrome); (b) non-pathological excess production of male sex hormones (androgens) in the adrenal glands or ovaries; also known as idiopathic or "common" hirsutism. Psychological disturbances (e.g. uncertainty about sexual role) almost always occur, generally after and rarely before the development of the abnormal hair. Incidence: 3 to 4%.

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Histamine. Neurohormone or tissue hormone; a biogenic amine (q.v.) obtained by biosynthesis from histidine (decarboxylation). Histamine occurs naturally in many organs (intestine, lungs, liver, skin, central nervous system, etc.). The main physiological effects are: dilatation of the capillary blood vessels with a substantial drop in blood pressure, contraction of the smooth musculature (uterus, intestines, bronchial muscles), and strong stimulation of the secretion of gastric acid. Histamine is assumed to be important in the pathogenesis of allergies, and in the origin and conduction of pain. In antigen-antibody reactions, and in particular in anaphylactic shock, large quantities of histamine are released. Smaller amounts are released in sensory pain. The role of histamine in the central nervous system has not yet been definitively explained. Its concentration distribution is similar to that of the catecholamines. A fairly large number of centrally effective drugs block the effect of histamine (see, e.g., *Antihistamines*; *Neuroleptics*). See *Psychosomatics*.

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Histogram. A histogram is a graphic representation of the frequency distribution (q.v.) for a discrete variable. The frequency for each class is shown as a vertical bar. *W.H.B.*

Historical psychology. For this school (founded by J. H. van den Berg), the objects of psychological research can be determined only from their history, since they develop in the course of time. This applies in particular to the higher mental processes (needs, will, operations of the intellect, personality). This approach has led to the study of "mentalities" (L. Febvre) and recently to research into the archeology of knowledge (M. Foucauld). *P.M.*

History of psychology. I. The roots of psychology go back thousands of years and reach into many areas of knowledge. Folkways, magic, religion, philosophy and science have all contributed to the origin of psychology. It is likely that every culture had its own psychology in order to postulate causes for certain human thoughts, actions and events. But the early history of psychology, like the early history of Western thought in general, is primarily known to us through the writings of the Greek philosophers.

1. *Early Greek naturalists.* While speculating on the nature of the universe, the Greek philosophers of the sixth century B.C. were already discussing certain psychological problems. As pointed out by Esper (1964), they considered all nature as animate. Matter, animals and men were thought to be alive because they moved. Thales (c. 625 B.C.), for instance, allowed a magnet a soul because it moved iron. Anaximander (c. 610–c. 547 B.C.) proposed an evolutionary theory, suggesting that life arose from sun-heated mud. He also thought that water was basic to all substance, because it was universal, appeared in many forms, and produced movement when changing its aggregate state. Heraclitus (c. 535–c. 475 B.C.) considered

fire as the primary force and "soul-substance", because it moved and transformed matter. All matter was thought to be in a constant state of flux, and only the orderliness in which change occurred presented constancy, rationality or "logos". Heraclitus also believed that all knowledge must come through the senses, a notion that formed the basis for the psychological thinking of the British empiricist philosophers of the eighteenth century, and in turn the basis for present-day methods of conditioning, reconditioning, and behavior modification.

Democritus (c. 460–c. 370 B.C.) presented the first atomic view of the universe, when he said that matter, like humans, was composed of small, mobile atoms which entered the body to give it life or soul. Different parts of the body were thought to be formed by different types of atoms responsible for a variety of functions. Democritus described the brain as the organ of thought, the heart as that of anger, and the liver as that of disease. He did not distinguish sensing from thinking, since both were based on atomic motion (Diels, 1934).

2. *Early Greek anti-naturalists.* Not all pre-Socratic philosophers believed that mind and matter, or body and soul, had equal properties and were subject to one and the same natural law. Nor did they all agree on the reliability of the senses as indicators of reality. Pythagoras (c. 582–c. 500 B.C.) and his followers were fascinated by numbers, and explained many abstract concepts by them. The Pythagoreans did not consider the soul and the body as one entity, but postulated that the soul leaves the body after death to undergo a possible succession of reincarnations. This division of body and soul was much elaborated by the Christian philosophers, who thus prepared psychology for the dualistic approach of mentalism and mechanism.

Protagoras (c. 480–c. 410 B.C.), an older contemporary of Plato, recognized the subjective value of the human senses and doubted their objectivity. He pointed out that

sensations and perceptions differ between and within individuals, being subject to a constant flux of biological and social influences. Hence his famous saying, "Man is the measure of all things" (Diels, 1934).

Anti-naturalism reached its peak with Plato. He thought the senses were unreliable, because one could perceive, for instance, triangles of all shapes and sizes and still maintain an idea of triangularity. It is therefore the idea, the form, or the abstract thought which yields true knowledge. Sense perception, Plato believed, yields only probabilities and approximations. He had so much faith in reason that he preferred it to observation, a viewpoint that has often hindered the future accumulation of psychological knowledge.

The Greek philosophers established two more or less discrete philosophical approaches to psychology. One approach emphasized reason, logic, thought, theory, innate knowledge, and a mind distinct from the body. The other approach emphasized observation, experimentation, environmental learning, and unity of body and soul. Much of all future psychology has fallen into one of these two camps.

3. *Aristotle.* The views of Aristotle (384–322 B.C.) cannot be assigned to either camp. Aristotle was a theorist as well as an observer. Watson (1968) considers him to have been the first psychologist because he tried to present a systematic and integrated view of the function of the human mind. The many topics he wrote about are very similar to the titles of chapter headings in modern general psychology texts.

Unlike Plato, Aristotle thought that form cannot be separated from matter—that a bronze statue, for instance, must have matter in order to have form, and vice versa. This unifying concept is also present in Aristotle's view of the "psyche", often interpreted as "soul" or "mind". Aristotle's soul includes matter as well as the functioning of the mind. Its development is based on evolutionary principles—on a vegetative soul attributed to plants, a sensory soul attributed to animals,

and a rational soul belonging to man. Aristotle's "psyche" did not have any religious or supernatural properties. Religious and supernatural properties were added over a thousand years later by the scholastic philosopher St Thomas Aquinas.

Aristotle wrote about the five senses and postulated a sixth one necessary to combine the functions of any two or more senses. He thought that we must rely on the senses to make factual observations, but warned that empirical data, no matter how correct, are useless if interpreted with false logic or wrong premisses. He also warned that correct logic is misleading if based on faulty observations. He thought knowledge was a combination of sense experience and thinking.

Many of Aristotle's hypotheses on the nature of remembering and forgetting have given rise to much experimentation in the area of learning. His doctrine of association (q.v.) stated that memory is facilitated by either similarity or dissimilarity of a present and past event, or by their close relationship in time and space. Later these hypotheses became known as the laws of similarity, contrast, and contiguity.

Aristotle formed theories about desires, appetites, pain and pleasure, reactions, and emotions. His doctrine of catharsis suggested, for instance, that fears can be transferred to the hero in a tragedy—an idea which much later formed one of the tenets of psychoanalysis and play therapy.

4. *Early Christian period and the Middle Ages.* There was little inquiry into psychology during the early Christian period and during the Middle Ages. St Augustine's (354–430) teachings were accepted for hundreds of years. He emphasized the introspective method, believing that "self-knowledge," subjective reflecting upon one's own mind, is more exact than knowledge gained through sense perception. The main force of the mind or the "self" was the power of the "will," which in turn, was responsible for habits, actions, and faith. Involuntary bodily functions, however, were not considered part of

the "self" and were to be neglected and ignored—an attitude which has remained in Western culture where autonomic functions such as sex, and gastro-intestinal activities are still preferably conducted in privacy.

St Thomas Aquinas (1225–74) accepted Augustine's concept of "faith" and "will" as well as Aristotle's "reason." In this amalgamation Augustine's "will" became subordinated to Aristotle's "reason," and Aristotle's "rational soul" became immortal and resurrectable. Aquinas also modified Aristotle's hierarchical concept of "souls" or "psyche." He postulated that there was only one soul, but that this soul was composed of a rational faculty which was non-physical and deathless, and of sensory and vegetative faculties which were physically dependent and perished with the body.

5. *Beginnings of modern psychology.* Aquinas' definitions of reason, mind, soul and body were not challenged until Descartes (1596–1650) introduced his dualistic concept of man. He held that the mind or soul is located in the brain, though it has no substance. The body, on the other hand, was thought to have substance, or "extended" qualities which, like machines, followed mechanical laws. Descartes further believed that the mind can influence the body and the body the mind, and he attempted to describe the physiological mechanisms of this interaction. Descartes is often called the first modern psychologist, because psychology would have remained speculative without the introduction and the recognition of physiological factors.

After Descartes's introduction of the concept of interaction, philosophers began to debate about the qualities and the quantities of the body's influence on the mind. They were primarily interested to know whether such mental qualities as knowing, thinking, and ideation arise within the mind, or come to the mind via the body's senses. John Locke (1632–1704) took a radical environmental view. He maintained that the mind is a "blank tablet" (*tabula rasa*), that all knowl-

edge must enter the mind through the senses, and that ideas are, in turn, combinations and reflections of sensory impressions. Locke and other British philosophers such as Hume, Hartley, the Mills, and Bain, who held similar views, became known as the "British empiricists." They are also called "associationists," because they believed that Aristotle's principles of association play a major role in the selection, storage, and composition of all mental content such as knowledge, thought, images, and ideas.

Not all philosophers agreed with the empiricists. Berkeley (1685–1753) pointed out that the mind, as in the case of depth perception, for instance, needs to process information from retinal size differences, clearness of the image, tension from certain eye muscles, and so on—information or stimuli not directly related to depth perception. Berkeley argued that the ultimate reality lies in the mind and not in the matter found in the environment.

Psychology's major problem had been that of "body and soul." The nineteenth century superimposed on it that of "nativism vs. empiricism," or that of heredity vs. environment—a problem which still causes much discussion in the measurement and definitions of such psychological factors as temperament and intelligence.

6. *Physiology and the mind.* The physiologists of the nineteenth century gave much to the philosophers who theorized about the content and functions of the mind. Pierre Flourens (1794–1867) demonstrated that certain parts of the brain are directly responsible for certain behavioral functions. When he extirpated the cortex of a bird, for instance, he found that it could no longer fly "voluntarily," but only if thrown into the air. Paul Broca (1824–1880) attempted to locate the brain area responsible for speech, and in 1870 Fritsch and Hitzig discovered the area of the cerebral cortex related to motor functions (Boring, 1950, pp. 61–79).

The studies of sensory receptors, nerves, and muscles also contributed much to the

understanding of human feelings, thoughts, and activities. Du Bois-Raymond demonstrated in 1849 that neural activity is measurable, and that it is accompanied by an electrical impulse; and Helmholtz (q.v.) showed in 1850 that neural conduction requires a specified time. Sechenov (1863) examined reflexes and found that some animals can perform "purposive" acts by means of spinal reflex actions which do not require the activity of the brain.

Physiological discoveries such as the above were important psychological "break-throughs" because the nativists—the dominant majority—insisted that the functions of the mind had no physical correlates in space or time. Sechenov, for instance, was not allowed to publish his findings about the nature of reflexes under the title: "An attempt to establish physiological bases of psychic processes." The censorship committee of St Petersburg thought that the juxtaposition of "physiological" and "psychic" would corrupt the mores of society.

7. *Experimental psychology.* Psychology has been defined as the "product of the union of philosophy and physiology" (Keller, 1936, p. 21). Physiology brought not only physiological data but the scientific method in general to psychology, and scientists from non-physiological disciplines began to make important contributions. The physicist Gustav Fechner (q.v.) (1801–87), who was also a medical doctor and a philosopher, spent much of his lifetime investigating the relationship between the objective, physical world and the subjective, personal one. He measured the physical energy needed to produce various intensities of sensation. He found, for instance, that ten times as much energy is required to produce a tone which is heard twice as loud as before, a hundred times as much energy to hear the tone three times as loud, etc. Fechner's method became known as "psychophysics" (q.v.), and has found much use in apparatus design and human engineering.

The Dutch physician F. C. Donders

(1862) attempted to measure mental activities through reaction-time experiments. To obtain a time measure for thought he deducted the reaction time required for simple from that required for more complicated tasks.

Another scientific, but non-physiological method of exploring the mind was pioneered by Hermann Ebbinghaus (q.v.) (1850–1909). He investigated rates of learning and of forgetting, such as, for instance, the relationship between number of repetitions and length of memory. Ebbinghaus created and used the "nonsense syllable". He theorized correctly that the use of meaningful words would interfere with objectivity in learning experiments.

8. *Academic psychology.* In 1879 the first psychological laboratory was founded by Wilhelm Wundt (q.v.) (1832–1920) at the University of Leipzig. Wundt was trained in medicine, physiology and philosophy. He was a prolific writer "producing a total of 491 publications ranging from one-page articles to books 2,353 pages long" (Boring, 1950, p. 345). Wundt tried to investigate the mind by studying its conscious content, and more specifically the elements of sensation, such as intensity, duration, and locality. Wundt's preferred method was that of "introspection" (q.v.), in which an individual describes his sensations and feelings in discrete, technical terms. Wundt's laboratory became the center of psychological activities. Students came to him from all over the world to investigate problems related to visual perception, hearing, touch and taste, reaction time, word associations, and so on. The variety and the volume of Wundt's contributions to psychology are unique. Boring & Boring (1948) surveyed the background of American psychologists and found that a large majority were trained by teachers who in turn were pupils of Wundt. However, Wundt's influence in his own country was less pronounced (Wesley, 1965).

9. *Diversification of psychology.* Unity in psychology was short-lived and existed

perhaps only *in statu nascendi* in the early days at Wundt's laboratory. Other psychological schools were soon to follow which emphasized different methods for studying the mind. Oswald Külpe (q.v.) (1862–1915) founded a psychological laboratory in Würzburg in 1896. He and his students examined such complex tasks as thinking, remembering, and judging. They used a more molar type of introspection, believing that the Wundtian approach was too atomistic.

The principle of "wholeness" was later stressed again by the founders of "gestalt" psychology. In 1912 Max Wertheimer (q.v.) demonstrated that two stationary lights, lit in a certain succession, will give an observer the sensation of movement. Hence, Wertheimer and the gestalt psychologists maintain that the product, the experience, is not equal to the sum of the stimuli. The gestalt school has continued to oppose atomism and elementarism in psychological research, especially in the areas of sensation and learning. (See *Ganzheit*.)

In Russia, Pavlov (q.v.) (1849–1936) followed Sechenov's work in "reflexology." His work on the conditioned reflex has given many basic rules about the nature of learning, especially those which pertain to time relationships, generalization, discrimination, extinction, reward and punishment, etc., during the process of association between stimuli and responses.

Certain psychological schools and systems which evolved around the turn of the century differed not only in methodology, but about the purpose of psychology itself. Influenced by the writings of William James (q.v.) (1842–1910), psychology in America became "functionalistic." Its research method as well as its purpose became broader. Data from animals, children, and mental patients were admitted for research, and psychologists began to make practical recommendations for child care, education, industry, and living systems in general.

John B. Watson (q.v.) (1878–1958), the behaviorist, used the Pavlovian method of

conditioning to show that certain fears and desires of human infants can be conditioned by direct or indirect associations with physical pain or pleasures. Watson published experimental findings as well as much practical advice on child care (Watson, 1919, 1928). (See *Behaviorism*.)

There were other applied systems of psychology which contributed to its great diversification. The historical roots of Freud's psychoanalysis (q.v.) can be found in Greek literature, and in hypnosis and psychopathology (q.v.). Freud's practical task, the cure of neurotic and psychotic patients, produced his theories about the content and the functions of the "unconscious" (q.v.) mind.

Mental testing (q.v.), a psychological area of the most widespread and practical influence, began with the work of Francis Galton (q.v.) (1869), who tabulated the accomplishments of famous men and their offspring. The useful IQ test was developed by Binet (q.v.) & Simon (1905) to provide the Paris Schools Commission with an instrument which could predict whether or not a pupil would benefit from public instruction. In spite of revisions and modifications, the IQ tests, as used today, are essentially like the original ones designed by Binet & Simon.

Applied areas such as conditioning, psychoanalysis, and mental testing have provided, perhaps as by-products, many psychological theories. In some areas, the theories may have overshadowed experimental verification. Some psychologists feel that their science has been "oversold to an overwilling public" (Miller, 1962, p. 4).

10. *Approaches*. Three major historical works, by E. G. Boring, Gardner Murphy, and W. B. Pillsbury respectively, were published in 1929. Boring's book has been the most systematic and influential. Several historical writers (Watson, 1968; Miller, 1962) have dedicated subsequent books to Boring. Boring's approach to history was the description of an individual's accomplishment in relation to the "*Zeitgeist*." Other

texts by R. S. Woodworth (1931), Edna Heidbreder (1933) and J. C. Flugel (1933) followed soon. They described the history of psychology chronologically through the development of psychological schools and systems. More recent chronological approaches are those of Mueller (1960) and Kantor (1963).

There are also biographical, autobiographical or "great men" approaches, such as the works of Pillsbury (1929), Murchison (1930), Garrett (1951) and Watson (1968). A different approach is the doxographic or problem approach, where the histories of a number of basic and recurring problems such as body—soul, consciousness, association, intelligence, and soon, are separately discussed. Works representing this type of approach have been written by Spearman (1937), v. Schiller (1948), Pongratz (1967), and others.

Esper (1964) presents a history guided by a biophysiological theme. Histories from geographical and/or ideological viewpoints have also been written. Hearnshaw (1964) described the history of British psychology, and Roback (1964) the history of American psychology. Brožek (1969) reviewed the work of Petrovskii (1967) which centers upon the theme of the fundamental reconstruction of Russian psychology on a Marxist-Leninist basis; and that of Yaroshevskii (1966), which discusses the birth of psychological thought in Egypt, China, and India, and—in the Marxist spirit—views psychology as having developed from the practical needs of society. A useful bibliography for all major works on the history of psychology published after 1900 is given by Misiak & Sexton (1966, pp. 469–70).

11. *Past, present and future.* More than half a century ago, in his first sentence of his *Abriss der Psychologie*, Ebbinghaus (1908) said that psychology had a long past but only a short history. By "long past" he meant philosophy, by "short history," the experimental method. Much of psychology's history has been written in retrospect. In many

instances the writers of psychological ideas did not show historical continuity. Esper (1964, p. 176) points out that associationism, for instance, was first discussed by Plato, later by Aristotle, millennia later by Hobbes in 1650, and again in 1695 by Locke, who thought that the principles of association had not been "hitherto considered." Esper also compares passages from the writings of William James (1890) and Hull (1930) with passages from Aristotle's *On Memory and Reminiscence* and finds many new terms, but few new ideas. He believes that psychology has led other sciences in its neglect of history.

At present the history of psychology seems no longer neglected. In the sixties there has been much renewed interest in its teaching and research. In France a history course has been included in the basic psychology curriculum. Miller (1962) has written a text to teach introductory psychology through a historical theme, and Lyman (1970) has reported on the success of such an approach. The following events have strengthened the history of psychology on the American scene:

The *Archives of the History of American Psychology* were established at the University of Akron (Ohio) in 1961 under the directorship of J. A. Popplestone. The first volume of the *Journal of the History of the Behavioral Sciences* appeared in Jan. 1965 under the editorship of R. I. Watson. The Division of the History of Psychology was established as the 26th division of the American Psychological Association in 1966. The first Summer Institute in the Teaching of the History of Psychology was held at the University of New Hampshire under the directorship of Josef Brožek in 1968. The first meeting of the International Society for the History of the Behavioral and Social Sciences (ISHOBSS) founded by Julian Jaynes was held at Princeton University in May 1969.

Research continues and certain parts of the history of psychology are still being written. For instance, Mountjoy *et al.* (1969) have

recently described the falcon training techniques used by Frederick II (1194-1250). They found some striking similarities between medieval falconry and contemporary operant animal psychology.

Psychology has broadened in scope and method. Future accounts will probably include more of the histories of other disciplines, such as anthropology, chemistry, mathematics, medicine, and sociology. This diversification will make the future history of psychology more difficult, but also more obviously necessary, since the history may become the only meaningful link between the various divisions, and the basis for evaluating the many specialties which will arise.

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II. Contemporary psychology. A study of the history of contemporary psychology shows one significant feature, namely the gradual break-up of the major systems and schools such as gestalt psychology (see *Ganzheit*), behaviorism (q.v.), and, to a much lesser extent, psychoanalysis (q.v.). S. Koch, the editor of *Psychology: A Study of a Science*, noted (1959): "... a far more open and liberated conception of the task of psychology, the role of its investigators and systematists, than we have enjoyed in recent history." (See also the general survey of contemporary psychology in *Handbuch der Psychologie*, 1959-70.)

If we inquire more specifically into the nature of this "open and liberated conception", we see with reference to the basic assumptions and positions of psychology, as Marx observed (1963), a greatly increased interest in positivist and empirical science. As regards methods, we find that they are used eclectically and pragmatically, substantial progress having been achieved by more advanced methods of data acquisition and processing (e.g. electronic test apparatus, use of computers). The conventional areas of research in psychology are becoming more

and more narrowly circumscribed, e.g. the role of motivation psychology in perception and learning. At the same time, links with neighboring disciplines such as physiology and sociology are becoming increasingly complex. New applications of psychology result from technological projects (e.g. space travel) and the more complex demands of modern social life.

While noting the growing objective and methodological diversity of psychology, the question of its theoretical unity must not be overlooked; indeed it must be stressed, as Foppa has recently suggested (1970), if psychology is to be brought closer to the aim of becoming a science of experience.

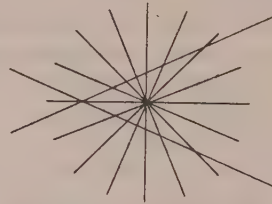
The above observations are concerned primarily with psychological research; however, it is also desirable to consider psychology as a theory and profession. As regards psychology as a theory, it has come to acquire a dual role through progressive developments in the universities: on the one hand its form and content are being questioned like other university disciplines while on the other it is called upon to remedy this unsatisfactory state of affairs. In this practical context, psychology seems not so much to lack the necessary means, when we consider the achievements of ability diagnosis, intelligence and creativity research, learning psychology (e.g. programmed learning), socio-dynamics, counseling and psychotherapy, as the ability to use the available means in an organized manner in a given practical problem situation. As regards psychology as a profession, it has taken over a wide range of social functions in the USA and become firmly established in these areas (the American Psychological Association has more than 26,000 members in some thirty sections). Professional representation in other countries is far less developed; Britain, Germany and Japan are among the few countries which approach the American example.

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Hit. In parapsychology: a trial in which the call (q.v.) matches the target (q.v.). Every trial is either a "hit" or a "miss". Displaced hit = trial on which the call matches the target intended for a different trial either earlier than the given trial (= backward or negative displacement) or later (= forward or positive displacement). Cf. retrocognition (q.v.) and precognition. (q.v.) J.B.

Höfler's illusion. This illusion demonstrates the distortion induced in the perception of



straight lines if they cross a field of radiating lines, and is thus in principle identical to *Hering's illusion*. (q.v.) C.D.F.

Holism. J. C. Smuts' theory that whole entities (and, above all, living beings) have specific characteristics which differ from those of their individual parts (entelechy). Holism is an integral part of biological research associated with mutationism (H. de Vries) which considers evolution as a consequence of intermittent variation that can be traced back to sudden restructuring. Against this background, the cause of evolution is to be found in internal characteristics of the organism interpreted as a structure, and in an organizational principle inherent in living matter (by comparison with chemical and physical properties). A correlation can be established between these theoretical notions and the concepts of gestalt psychology. See *Ganzheit*.

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M.J.B.

Holmgren test. A method of determining anomalies in color vision by classifying threads of colored wool.

G.Ka.

Homeostasis. The term homeostasis was used by the American physiologist Cannon (1932) to characterize the totality of effects responsible for maintaining a certain (relative) physiological constancy (e.g. body temperature, blood sugar). Cannon made a distinction between different hierarchical, homeostatic levels: reflex and instinctive behavior, acquired habits and adaptations, and willed actions, which serve the self-regulating system intent upon maintaining a "fluid" equilibrium (Bertalanffy, 1968). This extension of the concept made it possible to move forward from a study of organic need (deviation of an actual physiological value from the reference, or desired, value) to experimental analysis of psychological requirements within the framework of a motivational and behavioral psychology.

In cybernetics, a distinction is made between two forms of homeostasis (Ashby, 1952). In the simpler case the organic system has control or regulation circuits. But there are also complex organic systems whose mechanisms allow a transition to be made from states within which the desired value can no longer be reached, to other states, until the stability of the corresponding physiological parameters can be assured again ("ultrastability"). A technical model of this form of homeostasis is provided by the *homeostat*, whose feedback systems can compensate any slight deviation of the actual from the desired values. See *Cybernetics; Feedback system; Machine learning*.

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D.Vo.

Homoeroticism. Erotic interest in members of one's own sex. Usually taken as being more general than *homosexuality*.

G.D.W.

Homogeneity; homogeneity index. Similarity. The term is used in psychology primarily to characterize samples of group members, and test methods. A test manifests homogeneity if it covers only a single, narrowly defined dimension of personality. The index of homogeneity (e.g. Loevinger's homogeneity index, 1947) determines this factor quantitatively on the lines of a correlation coefficient (q.v.).

Bibliography: Loevinger, J.: A systematic approach to the construction and evaluation of tests of ability. *Psychol. Monogr.*, 1947, 64, 285.

P.S.

Homogeneous. The term has the same meaning in statistics as in general usage. If two sample distributions have roughly similar statistics (originating from the same population) they are considered to be "homogeneous" (e.g. with reference to the mean values of their variance).

In test theory (q.v.), test problems in a sub-test are described as homogeneous if they have (a) a high degree of correlation (inter-correlation) in relation to items of other sub-tests and/or (b) retain their relative position with reference to the other items in terms of probable resolution on confrontation with varying degrees of intensity of a given feature (gradual differences).

W.H.B.

Homogeneous grouping. See *Ability grouping*.

Homogeneous variance. The term is used when samples originate from the same basic group. In other cases heterogeneous variance is said to occur. Homogeneous variance is assumed in using certain parametric test methods (e.g. analysis of variance).

W.H.B.

Homology. Behavior patterns can be homologized in the same way as organs, i.e. they may be derived from common basic forms (K. Lorenz). A. Remane has compiled the homology criteria for morphological structures. According to G. P. Baerends, such behavioral elements are homologous if they have the *same neuromuscular pattern*, even if the motivation superimposed on them has changed. Behavior patterns are dependent on time, and as such are certainly the more homologous (identical) the more special features they have in common (criterion of special quality), and the more they accord in their sequence of action (criterion of position in the structural system). A distinction must be made between hereditary homology and traditional homology (Wickler, 1967).

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K.Fi.

Homophony, mnemonic. "Consonance." A term introduced by Semon (1908): *mnemonic* excitation (memory) and *actual* excitation (sensation) coincide. Recognition and discrimination occur as a parallel response.

Bibliography: Semon, R.: Die Mneme als erhaltendes Prinzip im Wechsel des organischen Geschehens. Leipzig, 1908.

H.W.

Homoscedasticity. The equality of sample variability. Equal variability is a prerequisite of *t* tests (q.v.) for homogeneous variance, and of analyses of variance (see *Variance, analysis of*).

D.W.E.

Homosensorial reproduction. A term proposed by Ziehen to describe reproduction from the same sensory area as that which originally received the material, as opposed to heterosensorial (q.v.), reproduction.

C.D.F.

Homosexuality. Sexual attraction by and sexual contact with persons of the same sex;

in the narrower sense: continuous, preferred sexual attraction by such persons ("genuine homosexuality").

Attitude to homosexuality. It is socially rejected in Western societies, but for the most part accepted in tribal cultures with no written codes of conduct (64% according to Ford & Beach, 1952); homosexuality among adult males is punishable today only in a minority of countries, primarily for ideological reasons. In international, scientific discussions, proponents of the acceptance of adult homosexuality have long been in a clear majority.

Incidence. In the USA, about 4% of adult white males have *only* homosexual contacts; after puberty about 37% had at least one homosexual experience leading to orgasm. The incidence was much rarer among women (Kinsey, 1948). Temporary homosexual contacts are widespread among young males (developmental or occasional homosexuality). As yet there is no empirical evidence of an increase in homosexuality in recent decades (cf. Kinsey).

Educational and social background. Studies conducted up to now in the USA, Czechoslovakia and West Germany show a concentration of male homosexuality in the middle to upper middle social and educational stratum; in regard to socio-economic level, the lower social stratum dominates in the USA, and the middle social stratum in Europe (Giese, 1967).

Psychological-psychopathological aspects. While some studies of homosexual males revealed no neurotic symptoms (Hooker, 1957; Dean & Richardson, 1964), others have recorded slight or considerable neurotic reactions in the form of schizoid and psychasthenic character traits, mistrustful attitudes, hypochondriac, depressive and hysterical reactions, as well as approximations to neurotic test profiles in the sense of extremely labile, sensitive, dependent and anxious and uncertain (Doidge & Holtzmann, 1960; R. B. Cattell, 1962; Morony, 1962). In many homosexual groups, in particular of

intelligent and "bisexual" subjects, there is no striking frequency of neurotic maladjustment (summary: Schmidt, 1968).

Social and psychological aspects. Only a minority (less than 5%) of homosexuals identify themselves with the disagreeable impression held by the general public of the male homosexual (soft, impulsive, weak, emotional, modern, light, unbalanced, unsympathetic, sick, confused, disgusting). The majority have a positive view of their own character which differs from the heterosexual male's idea of himself (Schmidt, 1967; Sigusch, 1967); although these findings are not based on a representative study of male homosexuals, they suggest that the identity and self-acceptance of many male homosexuals are less disturbed than might be expected in view of the strong prejudices held by the public at large.

Research into causes. The causes of homosexuality are still open to question. At present there are three theories concerning the origins of homosexuality. (a) Biologically oriented theory: homosexuality is dependent on biological factors which are not influenced by experience. (b) Psycho-socially oriented theory: homosexuality is conditioned by the environment, i.e. dependent on experience, and acquired (psychoanalytical theory and learning theory); (c) Convergence theory: homosexuality stems from a biological (learning) disposition; its occurrence in an individual is, however, dependent on environmental influences (summary: Freund, 1960).

Therapy. Many modern theorists believe that homosexuality is a variant of normal sexuality which can be treated by helping the homosexual to accept his own condition and not by attempting to convert him to heterosexual forms of conduct. On the other hand, when a homosexual wishes to change the direction of his attachment, those who consider it to be a parasymphathetic response which is the chance product of conditioning, would recommend conditioning techniques that teach the homosexual to associate members of his own sex with unpleasant

rather than pleasant erotic sensations. See *Aversion therapy; Behavior therapy; Sexuality.*

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H.M.

Honesty. The degree to which truth and respect (for others) determine behavior. Of particular practical importance in interpreting data furnished by questionnaires. In spite of largely positive correlations between various honesty tests, only Brogden has succeeded in isolating a honesty factor (q.v.) (characterized by behavior in which higher marks can be scored only by cheating, lying and exaggerating, as detected by the experimenter). See *Conscience; Child psychology; Traits.*

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M.A.

Honi phenomenon. When a person is very well-known to S., he or she may fail to appear

distorted in size or shape in the (Ames) distorted room (q.v.).

Horde. The primitive form of human association consisting, according to Charles Darwin and Freud, of an extended family dominated by a strong "father." Modern ethnographic field research makes it impossible to accept this reconstruction of a primitive society. Erect primates such as chimpanzees and gorillas live in loose groups (J. Goodall, G. Schaller, I. De Vore). This also applies to the remaining tribes of hunters and food gatherers, whose groups are never based on a strictly patriarchal structure and have a very flexible membership. The short life expectancy of paleolithic hunters (twenty to twenty-six years) in itself makes it difficult to believe that the younger generation was ever repressed by the "fathers." Recent field research into the various societies of Australian aborigines, which were considered for a long time to be examples of the "horde", has revealed a far more complex pattern.

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W.Sc.

Horizontal disparity. Because our eyes are about two inches apart, there are slight discrepancies in the two pictures of the world that they receive. These discrepancies can be used to calculate the distances of the various objects seen by the observer. The discrepancies can occur in any of the three spatial dimensions. There may be *height disparity*, *longitudinal disparity*, and *horizontal disparity*. Experiments have shown that horizontal disparities give rise to depth perception, and this, of course, is the normal disparity produced by the horizontal separation of our eyes.

C.D.F.

Hormic psychology. In order to break with the exaggerated concern with cognitive phenomena, perceptions, ideas, cognitive development and thinking processes, many psychologists have concerned themselves since the turn of the century with research into the motivations and aims of the organism. W. McDougall (1871–1938), for example, stressed the dynamic aspects of behavior and studied the fundamental needs of the organism. This school of thought has aligned itself with psychoanalysis (q.v.) in its emphasis on the teleological aspects of all behavior(s).

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P.M.

Hormones. 1. *Definition, formation and general effects.* Hormones are substances formed in the body in the internally secreting glands (*glandular hormones*) or in specific cell systems (*tissue or cell hormones*). The glandular hormones are discharged directly into the bloodstream by the corresponding gland systems, and take effect in certain organ systems or stimulate the secretion of other hormones in specific glands (see *Glandotropic hormones*). Tissue and cell hormones are generally active only at their points of formation; cell hormones are usually active only in the cell in which they are formed. Tissue or cell hormones, which are formed in the central nervous system or autonomic nervous system and act as transmitter substances (q.v.) to the synapses (q.v.) or effectors, are referred to as *neurohormones* (in particular, acetylcholine and noradrenalin, q.v.). This category is also often taken to include substances which play a decisive part in the metabolism of the nervous system (see *Biogenic amines*). The main hormone-producing glands are the anterior pituitary (adenohypophysis), posterior pituitary (neurohypophysis), pineal gland (epiphysis), thyroid gland, parathyroid gland, thymus, pancreas (Langerhans' islets), adrenal gland and

adrenal cortex, ovaries and testes. The hypothalamus (q.v.) is another production center; it generates the releasing factors. These are substances whose nature has not been entirely explained; they are conveyed to the endocrine glands (q.v.) through the nerves. Several hormones are formed not only in special glands but in other systems, e.g. the catecholamines (q.v.). All known hormones are steroids, proteins or amino-acid derivatives. All the major hormones can be synthesized and introduced into the circulatory system or brain from outside (locally if necessary). Many hormones do not pass the blood-brain barrier (q.v.), or liver barrier. Hormones regulate the equilibrium of many different organ systems and perform the following main functions: (a) regulation of the metabolism (e.g. carbohydrate metabolism regulated by insulin); (b) morphogenesis, i.e. growth and maturation; (c) stimulation and depression of the CNS and ANS; (d) regulation of the inner environment for adaptation to external conditions.

2. *Effective mechanisms of hormones and interaction between different hormone systems.* Hormones have a profound influence on physiological and psychological processes. The biochemical mechanisms of these effects have been elucidated only in part. It is generally believed that hormones act locally and in the cells by altering cell permeability or by influencing the synthesis or breakdown of enzymes. Analysis of the biochemical mechanisms is made difficult by many methodological problems. Many theories are based solely on animal experiments (sometimes *in vitro*), and often merely on indirect manipulations in human beings (e.g. with pharmaceutical compounds), or on pathological symptoms occurring with under- or overproduction of specific hormones. The study of hormone effects is complicated by interaction between different hormone systems. The various hormones are sometimes *antagonistic* (e.g. adrenalin—insulin), *synergistic* (glucagon—adrenalin), or form simple or complex regulating circuits. The relation-

ship between the glandotropic hormones and the peripherally secreted hormones can be explained on the negative feedback principle. The secretion of glandotropic hormones leads to secretion of peripheral gland hormones, which in turn block the further formation of glandotropic hormones. Several hormone systems function (in part, at least) synergistically (e.g. adrenal gland—thyroid gland).

3. *Hormones and the nervous system.* Close, though as yet incompletely explained, relationships exist between the CNS, ANS and hormone systems, and form the object of neuroendocrinological research. So far only the relationship between the hypothalamus and pituitary has been explained in any detail: vasopressin (an antidiuretic) and oxytocin are formed in certain neuron(s) of the hypothalamus, and conveyed by the nervous system to the neurohypophysis and thence into the bloodstream. Secretion of glandotropic hormones also probably occurs with the participation of the hypothalamus (releasing factors). Electrical stimulus tests in animals have shown that localized hypothalamic stimulation leads to the secretion of specific glandotropic hormones. In addition, stimulation and elimination tests show that the peripheral secretion of catecholamines is associated with nervous excitation in the reticulo-thalamic and limbic system (e.g. *nucleus amygdalae*). The previously held assumption that the hypothalamus and pituitary are the sole links between hormones and the nervous system is therefore false. The influence of cerebral electrical activity by the peripheral and centrally localized supply of hormones, or by hormonal disturbances, may be considered certain; the mechanism on which these changes are based is, however, still unexplained. The relationship between the nervous system and hormones is particularly clear in the effective action of the neurohormones, noradrenalin(e), dopamine, acetylcholine, etc. Neurohormones are liberated when the central neuron(s) on the synapses are stimulated (see

The most important hormones, their functions, associated disorders, and some psychologically significant findings derived from healthy individuals.

Produced by	Hormone	Most important functions	Some pathological changes with		(a) Psychol. & physiol. effects of low doses administered <i>exogenously</i> to healthy Ss. (b) Change in hormone activity in healthy Ss under stimulus variation
Anterior pituitary	Growth hormone (somatotropic hormone = STH = somatotropine)	Promotion of growth, protein synthesis and fat oxidation (together with testosterone, thyroid gland hormones, insulin), RNA synthesis	Hypofunction (deficiency)	Hyperfunction (excess)	
	Thyrotropic hormone (= TSH = thyrotropin(e))	Growth of thyroid gland, promotion of biosynthesis and stimulation of thyroid gland hormone secretion	Before completion of growth: pituitary dwarfism	Before completion of growth: gigantism. After completion: acromegaly	(a) increased activity (?) (b) increased production in hypoglycemia, muscular effort
	Adrenocorticotrophic hormone (= ACTH = corticotropin(e))	Stimulation of production of cortical hormones in the adrenal cortex (exception, e.g., aldosterone)	As for thyroid gland hormones	As for thyroid gland hormones	
	Gonadotropic hormones (= gonadotropins: (a) follicle stimulating hormone (= FSH)	Growth and maturation of the follicle, estrogen formation; in the male: promotion of spermatogenesis	As for adrenal cortical hormones	As for adrenal cortical hormones	(a) euphoric reactions (?) (b) increased release under all forms of trauma (stress) ("adaptation hormone")
	(b) luteinizing hormone (= LH = interstitial cell stimulating hormone = ICSh)	Ovulation. Induction of follicular development and corpus luteum formation, stimulation of estrogen formation. In male: formation of testosterone, potentiation of effect of FSH	Amenorrhea, obstruction of spermatogenesis		
Posterior pituitary	Luteotropic hormone (= LTH = prolactin)	Increases progesterone formation in corpus luteum; effect on lactation; shares in initiation of breeding behavior	Amenorrhea		
	Oxytocin	Contractions of uterus (induction of labor), lactation (release of milk in response to sucking)	Disorders of labor process		(a) decreased blood pressure, contraction of uterus
	Antidiuretic hormone = ADH = vasopressin	Antidiuresis, neurohormone, assists release of ACTH	Diabetes insipidus (polyuria)	Antidiabetes insipidus	(a) increased blood pressure, decreased diuresis (b) increased production under stress

Intermediate (?) pituitary lobe		Melanotropin (melanocyte- stimulating hormone = MSH)	Skin pigmentation, assists regulation of dark adaptation of eye	Disorder of pigment formation	(a) Increased skin pigmentation
Thyroid gland	Thyroid gland hormones	Thyroid gland hormones: triiodothyronine, tetraiodothyronine (= thyroxine)	Promotion of oxydative processes; assistance in regulation of protein synthesis, and in thermoregulation	Myxedema; with congenital or early acquired hypofunction, cretinism; adiposity; general deactivation	(a) subjective and objective activation, excitation (b) increased secretion under stress, cold stimuli
		Thyrocalcitonin (calcitonin)	Lowers blood calcium (antagonizes parathormone = parathyroid hormone)		
Parathyroid gland		Parathormone (PTH) (= parathyroid hormone)	Raises blood calcium (antagonizes thyrocalcitonin)	Hypoparathyroidism (e.g. nervous excitation, tetanic attacks)	Hyperparathyroidism (e.g. changes in bone system, renal calculi)
Pancreas (islands of Langerhans)		Insulin	Lowers blood sugar (antagonizes adrenalin) by conversion into glycogen, influences protein, fat and carbohydrate metabolism, and hence growth	Diabetes mellitus	Hyperinsulism
		Glucagon	Raises blood sugar		(a) tiredness, dizziness, hunger, affects performance
Sex glands: testes		Sex gland hormones: androgens, e.g. testosterone	Promote maturation and growth of primary and secondary sexual characteristics; promotion of general growth synergistically with growth hormone, insulin and thyroid gland hormones	Hypogonadism (e.g. delayed puberty, under-development of primary and secondary sexual characteristics)	Plays part in origin of diabetes (?)
Ovaries	Sex gland hormones	(a) Estrogens, e.g. estradiol, estrone, estriol (b) Gestogens, e.g. progesterone (progestins)	Promote maturation and growth of primary and secondary sexual characteristics in puberty; induction of menopause, regulation of cycle. Promotion of general growth Preparation for and maintenance of pregnancy; together with estrogenic regulation of cycle	Menstrual cycle disorders Hypogonadism	(a) no specific psychol. effects in healthy women, increased performance in exhausted women (a) no specific psychol. effects in healthy Ss. Increased performance in exhausted Ss. (b) Reduced excretion in urine under stress
Placenta		Choriongonadotropin (human chorionic gonadotropin = HCG)	Gonadotropic hormone, formed only during pregnancy. Assists effect of LH		(a) impaired performance, subjective de-activation; reduced noradrenalin in CNS

Produced by	Hormone	Most important functions	Some pathological changes with Hypofunction (deficiency)	Some pathological changes with Hyperfunction (excess)	(a) Psychol. & physiol. effects of low doses administered <i>exogenously</i> to healthy Ss. (b) Change in hormone activity in healthy Ss under stimulus variation
Adrenal medulla	Adrenalin (epinephrin)	As antagonist of insulin, releases glycogen (blood sugar). "Ergotropic" regulation of organism		Increased blood pressure with tumors	(a) with small amounts: non-specific excitation (b) increased excretion under psychol. stress (anxiety)
	Noradrenalin (norepinephrin)	Ergotropic regulation of organism			(a) administration of small amounts has slight or no psychol. effects (b) increased excretion under physical stress
	(a) Glucocorticoids, e.g. cortisol (hydrocortisone), cortisone, corticosterone	Regulation of carbohydrate content	Addison's disease	Cushing's disease	(a) improvement of mood (?) (b) increased excretion under physical and psychol. stress
<i>Zona glomerulosa</i>	(b) Mineralcorticoids, e.g. aldosterone, 11-desoxycorticosterone	Regulation of sodium-potassium content		Hyperaldosteronism (symptoms: e.g. hypertension, decreased potassium rate)	(a) increased blood pressure, excitation (b) increased excretion under stress
<i>Zona reticularis</i>	(c) Androgenic cortical hormones, e.g. androstosterone, androstenedione	Synergistic effect with male sex gland hormones		Adrenogenital syndrome (virilism, gynecomastia); in childhood: pubertas praecox	As for androgens
Central nervous system and vegetative nervous system (ANS)	(a) Acetylcholine	Transmitter substance in ANS (preganglionic fibers of the sympathetic, pre- and post-ganglionic fibers of the parasympathetic) and CNS			
	(b) Serotonin	Transmitter substance in CNS (transmitter of central parasympathetic system (?)). Regulation of mood; assists sleep-waking rhythm		Depression (?) Schizophrenia (?)	(a) small quantities (precursor of S.): can be stimulating. Antagonizes LSD (b) reduction of S. concentration in brain during sleep
	(c) Tryptamine	Biogenic amine	Depression (?)		(a) Sympathicomimetic effects, subjectively stimulating (b) Reduced excretion in urine in moody periods
		Neurohormones or tissue hormones			
		Corticoids (corticosteroids)			
		Catecholamines			

	Neurohormones or tissue hormones								
Hypothalamus									
(d) γ -amino-butyric (= GABA)	Biogenic amine, derived from glutamic acid, inhibition of nervous excitation (?)								
(e) Histamine	Transmitter substance in CNS, assists in genesis of pain						Allergies Pain (?)	(a) drop in blood pressure, nausea, tiredness (b) liberation under anaphylactic shock and sensory pain	
(f) Tyramine	Biogenic amine							(a) sympathicomimetic effects, e.g. increased blood pressure, subjectively stimulating	
(g) Noradrenalin	Transmitter substance in CNS and ANS					Depression (?)		(b) increased secretion under stress	
(h) Dopamine	Transmitter substance in CNS, synergistic to noradrenalin, intermediate substance in biosynthesis of noradrenalin					Parkinson's disease (?) Depression (?)		(b) increased excretion in urine with increased activation	
(i) Angiotensin II	Assists in blood pressure regulation; increases release of aldosterone						Essential hypertonia	(a) rise in blood pressure—increased excretion of catecholamines in urine	
(j) Substance P	Transmitter substance in CNS (?), plays part in the conduction of sensory stimuli								
(k) Melatonin	Antagonizes melanotropin (inhibition of pigmentation), assists in regulation of light-dependent day-night rhythm							(b) reduced production under permanent lighting (animal tests)	
“Releasing factors” (e.g. TRF = thyrotropic hormone releasing factor; LRF = luteotropic hormone releasing factor; CRF = corticotrophic hormone releasing factor)	Stimulate release of anterior pituitary hormones								

Nervous system). They transmit this stimulation to other neuron(e)s or effectors, and therefore act as transmitter substances. With the liberation of the neurohormones, characteristic changes occur in the electrical activity of the nerve cell. Therefore the nervous system can also be considered as a hormone system.

4. *Hormones and psychological disorders.* Over- or under-functioning of the peripheral hormone glands are linked almost without exception not only with physiological but with psychological disorders. On the other hand, it has not been possible to show clear endocrine variations for the majority of mental disorders on the basis of hormones excreted in the urine or blood. In general, endocrine disorders do not lead to specific psychological changes. Yet relatively clear psychological changes occur in the dimension of activation (see *Arousal*) in some endocrine disorders. Promising hypotheses and theories have been put forward in the past twenty years by neuroendocrinologists and psychopharmacologists. Even if the details remain largely obscure, it may be assumed that psychiatric disorders such as schizophrenia (q.v.) and depression (q.v.) are linked with disorders of the metabolism of biogenic amines (q.v.) or neurohormones. These metabolic disorders possibly result from incorrect "programming" in the genetic code. Recent research into depression, in particular, has shown that endogenous depressions result from disorders in the metabolism of endogenous catecholamines or indolamines (see *Serotonin*).

5. *Hormones and behavior.* It is not possible to conclude from the sometimes drastic behavioral changes which occur with hormonal disorders that there is a clear relationship between hormones and normal behavior. Two methods may be followed by the endocrinological psychologist: the study of behavioral changes after the administration of hormones, or the analysis of the occurrence of specific hormones in the urine or blood as a function of systematically varied stimuli.

Both methods are problematical for theoretical reasons. Hormones administered orally or intravenously do induce replicable behavior changes, but it is doubtful whether this can offer anything more than hypotheses on the relationship between natural hormones and behavior. The effective mechanisms and concentration conditions are probably not comparable for externally administered hormones and internal hormone formation. It must be remembered that most hormones introduced into the bloodstream do not pass the blood-brain barrier. Many of the observed behavioral changes probably result in part from peripheral changes. Studies using hormone secretion as a dependent variable have been conducted, in particular for the catecholamines and corticosteroids. Both hormone groups can be determined relatively easily in the urine or blood plasma with good reliability. Stress stimuli increase the excretion of catecholamines and corticosteroids. All other hormones have not yet been studied sufficiently for their significance as indicators of psychological states. Even where a correlation has been shown between hormones and behavior, generalization is difficult because only small proportions of the biologically active hormones can be detected with conventional methods, i.e. the quantity detected does not allow conclusions on the level active in the organism. In addition, the origin of the hormones detected cannot be explained with any certainty.

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2. *Hormones and psychology*: Bajusz, E. (Ed.): Physiology and pathology of adaptation mechanisms. Oxford, 1969. Bleuler, M.: Psychische Funktionen u vegetatives Nervensystem: Endokrine Wirkungen auf die Psyche. In: Monnier (Ed.): *Physiologie und Pathologie des vegetativen Nervensystems*, Vol. 2. Stuttgart, 1963. Dewhurst, W. G.: *J. Psychosomatic Research*, 1965, 9, 115-27. Eiduson, S., *et al.*: Biochemistry and behavior. Princeton, 1964. Harlow, H. F. & Woolsey, C. N.: Biological and biochemical bases of behavior. Madison, 1965. Mandell, A. J. & Mandell, M. P.: Psychochemical research in man. New York, 1969. Meng, H.: *Psyche und Hormon*. Berne, 1960. *W. Janke*

Hormone types. Individuals featuring temperamental dispositions which occur as a function of the heightened or diminished effects of a hormone. Classification according to specific endocrine glands is possible only to a limited extent, e.g. in the case of the thyroid gland: hyperthyroidism = overexcitability; hypothyroidism = underexcitability. Otherwise the general term "endocrine psychosyndrome" is sometimes used.

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Hormopathy. According to R. Brun, a primary motivational or emotive disturbance ("anergia" or "anhormia"), which may have essentially organic (endocrine or cerebral) origins or psychofunctional causes (actual neuroses [see *Actual anxiety*] and psychoneuroses, q.v.). *W.Sc.*

Horner's law. J. F. Horner, a Zürich ophthalmologist (1831-86), first suggested that (most)

color vision defects, like the blood disease "hemophilia", are transmitted by inheritance through apparently unaffected female "carriers", i.e. from the affected man through his apparently healthy daughter to her male descendants. *K.H.P.*

Horoapter. The geometrical locus of those points in the field of vision which are reproduced on corresponding (identical) retinal points. A distinction is made between *geometrical* (derived) and *empirical* (calculated) horopters. If the correspondence is complete (both longitudinally and horizontally), there is a total, point, or full horopter. With a disparation in one of the main axes, there is a partial horopter: a longitudinal or vertical horopter; or, alternatively, a transverse or horizontal horopter.

The total geometrical horopter is the Vieth-Müller circle, which passes through the fixation point and the two optical points of rotation. The empirical total horopter differs substantially from the geometrical equivalent, and already becomes a straight line in the finite range; as the fixation distance increases, it becomes a line which is convex in relation to the observer. *A.H.*

Horoscope. An astrological concept; in the static sense, a summary of the personality, based on specific constellations of the sun, moon and planets at the moment of birth; in the dynamic sense, the influence of changing constellations at specific moments in time ("astral influence"). The horoscope is based on the assumption that man and the earth have a central position in the universe. In spite of complete rejection by scientists, astrology still has many proponents, who believe in aspects or trends of destiny determined by cosmic factors. The fact that many horoscopes are accurate is due not to astrology but to the diagnostic intuition of some perceptive astrologers. J. P. Guilford found that there are about 10/13 personality

factors which to some extent correspond to the signs of the zodiac. A horoscope may be interpreted as an attempt to apply long-confirmed experience to the problem of reducing the wide range of individual characteristics to a relatively small system of basic qualities (P. R. Hofstätter). A distinction is to be made between the astrology of horoscope-makers and the complex cosmologies of such figures as Paracelsus.

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Hospitalism. Generic term for all the psychological and physical disorders caused by a long stay in a hospital, clinic, or institution.

1. Hospitalism in the psychological sense is a syndrome of negative mental secondary effects which is particularly marked in small infants and other children who undergo institutional treatment for a long time or grow up in special homes. This is a progressive psychophysical process, intimately connected with development, which is explained by the failure to obtain satisfaction of the need for emotive exchange and human relations with a mother, the lack of emotional warmth and affective-emotional concern, and the absence of a family environment ("nest warmth"). Symptoms observed uniformly in the infant: tendency to cry, apathetic-depressive states, motor inhibitions or unrest, substitute satisfactions (spasmodic hand and head movements, thumb sucking, nail biting), retarded physical (standing, running) and mental development (speech, thought), and a poor state of health (susceptibility to infection, nutritional disorders) which may even lead to death. According to R. Spitz, hospitalized children in homes have a mortality rate of up to 40%. Irreversible damage occurs if the child is isolated from its mother for more than 5 months. R. Mathis has found that 75% of 1400 hospitalized children showed psychological or intellectual dis-

turbance. The predominant characteristics are low frustration tolerance, poor ability to establish contacts and low social adaptativeness, sometimes with aggressive reactions. In puberty, hospitalism may lead to regressive and criminal behavior. The first systematic descriptions of hospitalism were given by Pfaundler (1925) (cachectic treatment damage). Spitz's and Wolf's studies ("anacletic depression") (1945-6) have become much better known; their observations were confirmed and expanded by Bowlby (1951) and Dührssen (1958). These studies show that for a normal psychophysical development, a good mother-child relationship is more important than good hygienic conditions (cf. Harlow's experiments with monkeys). Attempts are now made to counteract hospitalism by creating closer and more stable relationships between nurses and children (small groups), and by establishing children's villages in which the children live in house communities in small groups of different age and sex, and are cared for by permanent house mothers. Arrangements are now often made to allow the mother of a hospitalized baby or small child to stay with it in the hospital. The psychological neglect of children in the family (e.g. because both parents are working), or attendance at day nurseries has been seen to lead to a "family hospitalism". Even in adult patients, hospitalism may develop after long hospitalization: i.e. in the form of increased dependence and an unwillingness to make a quick recovery. See *Child psychology*.

2. In the narrower, medical sense, "hospitalism" is a term sometimes used to denote all the damage resulting from the frequent occurrence of infection during a stay in hospital: infection either by contagion (staff, inadequate hygiene) or by resistant bacteria and viruses.

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responses in the infant monkey. *Science*, 1959, 130, 421-32. Pfaundler, M. v.: *Klinik und Fürsorge. Gesundheitsfürsorge für das Kindesalter*, 1925, 1, 3. Robertson, J.: *Young children in hospital*. London, 1965. Spitz, R.: *Hospitalism*. *Psychoanal. Stud. Child*, 1945, 1, 53. Id. & Wolf, K. M.: *Anaclitic depression*. *Psychoanal. Stud. Child*, 1946, 2, 113-17.

F.-C. S.

House-Tree-Person Test (Nbb. HTP). A thematic projective test in which S. is asked to draw a house, a tree and a human being. Reliability values are satisfactory. The test is intended to supply information on intelligence, affectivity and degree of maturity, especially in children.

Bibliography: Hammer, E. F. (Ed.): *The clinical application of projective drawings*. Springfield, Ill., 1958.

E.F.-K.

HPL. See *Human placental lactogen*.

H test. The H test is a distribution-free test method (significance test) for the simultaneous comparison of several groups of a classification variable with reference to the central tendency: i.e. differences between data are tested for statistical significance when the observations are ranked. A useful test when the conditions for a simple analysis of variance are not present. See *Variance, analysis of*.

W.H.B.

Hue. A basic property on the basis of which a color is given a specific name. Yellow, for example, is distinguished from orange, red and blue, and in general from any other shade or tint. The phenomenon is associated with narrow wavelength bands but can also be produced by fusing two or more variations of different wavelengths. The normal human eye can distinguish 200-250 hues.

G.Ka.

Hull, Clark Leonard. B. 25/5/1884 in Akron (N.Y.); d. 10/5/1952 in New Haven (Conn.).

Hull graduated from the University of Wisconsin in 1918. He was appointed Professor of psychology at Yale University in 1929. He concentrated initially on research into abilities (q.v.) and the development of statistical methods and psychological test methods; he then devoted ten years to the study of hypnosis (q.v.) and suggestibility, on which he published thirty-two articles and a book. Through his extensive studies of learning and motivation, and because of his systematic behavioral theory, which was unique in its stringent approach to the development of psychological theories, he became the most prominent representative of neo^o-behaviorism (see *Behaviorism*).

Systematic theory of behavior. Hull's theory of behavior can be considered as an S-O-R theory. In addition to the objectively measurable input (stimulus) and output (response) variable, he postulates a series of hypothetical parameters in the organism, known as intervening variables (q.v.), which establish the relationship between the stimulus and response values, and whose functional inter-relationship and relationship with the observed parameters Hull explained in verbal terms, and generally also in equation form, through seventeen postulates and seventeen assumptions (corollaries) derived from the postulates (hypothetico-deductive framework).

Hull's central postulate of primary reinforcement (q.v.), which is closely related to E. L. Thorndike's law of effect, states that: "Whenever an effector activity (R) is closely associated with a stimulus afferent impulse or trace (S) and the conjunction is closely associated with the rapid diminution in the motivational stimulus (S_D or S_G), there will result an increment (Δ) to a tendency for that stimulus to evoke that response." Primary reinforcement is important in the learning process; it consists of a reduction of the motivational stimulus generated by a drive (q.v.).

Hull also refers to a secondary reinforcement which occurs when a previously neutral

stimulus trace is frequently and regularly associated with the rapid diminution in the motivational stimulus (S_D) and in this way takes over the function of the reinforcing agent. But a stimulus-response association through contiguity under the influence of reinforcement always forms the qualitative prerequisite for the production and reinforcement of habits (see *Habit*).

Habit strength (${}_sH_R$) (tendency of a stimulus trace to evoke an associated response) is dependent on the number of reinforcements, and increases as a rising, negatively accelerated function of this reinforced stimulus-response association. The probability of the occurrence of a response, however, depends not only on habit strength, but on additional, non-associative factors included, in addition to the habit potential (${}_sH_R$), in the reaction potential (${}_sE_R$). Whereas habit potential is an expression of associative intensity, the intensity of the reaction potential indicates the actual tendency of a stimulus to elicit a specific reaction. Reaction potential can be determined from the speed, intensity and resistance to extinction of the reaction, but cannot be identified with the reaction, since it may either be located below a threshold value (and therefore not lead to the reaction), or may interact with competing tendencies (inhibitory potential; see *Inhibition*) (and therefore lead only to an incomplete reaction).

Assuming that the conditions remain constant during the learning process and reaction formation, reaction potential is determined (a) by habit strength ${}_sH_R$; (b) by the drive D obtaining during the learning process; (c) by the magnitude of intensity, i.e. the stimulus value V; and (d) by the incentive motivation K of the reinforcement. The interaction of these factors is multiplicative: ${}_sE_R = {}_sH_R \times D \times V \times K$.

Reaction potential, on the other hand, is counteracted by the inhibitory potential (${}_sI_R$), which is made up of the reactive (I_R) and conditioned inhibition (${}_sI_R$) and, as a function of the resulting effective reaction potential (${}_s\bar{E}_R = {}_sE_R - {}_sI_R$), may weaken or

neutralize the tendency to carry out specific action.

Main works: Aptitude testing. New York, 1928. Knowledge and purpose as habit mechanisms. Psychol. Rev., 1930, 37, 511-25. Goal attraction and directing ideas conceived as habit phenomena. Psychol. Rev., 1931, 38, 487-506. Hypnosis and suggestibility. New York, 1933. Mind, mechanism, and adaptive behavior. Psychol. Rev., 44, 1-32. Mathematico-deductive theory of rote learning: a study in scientific methodology (with others). New Haven, 1940. Principles of behavior: an introduction to behavior theory. New York, 1943. Essentials of behavior. New Haven, 1951. Autobiography. In: Boring E. G., et al. (Eds.): A history of psychology in autobiography, Vol. 4. Worcester, Mass., 1952, 142-63. A behavior system: an introduction to behavior theory concerning the individual organism. New Haven, 1952.

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W.W.

Hull's law. The central proposition in Clark L. Hull's theory of learning, that habit strength accumulates as a direct function of the number of reinforced stimulus-response occurrences.

G.D.W.

Human engineering. A branch of engineering science and applied psychology. Special emphasis is placed on ergonomics (q.v.) and industrial science, and above all on occupational psychology (q.v.) and industrial psychology (q.v.). Such problems as optimal working conditions, organization of men and machines, operator skills, and so on, are to the fore. See *Practice; Motor skills; Instructional technology*.

G.R.W.M.

Human ethology is the study of the phylogenetic (innate) and ontogenetic (acquired)

components of human behavior. Particularly valuable information can be obtained from the observation (e.g. by filming) of behavioral development in infants and children born deaf and blind, etc. See *Ethology; Comparative psychology*.

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Humanistic psychology. I. Humanistic psychology does not set itself up as a new school, still less as "a school to end schools". It does not deny the validity of any psychological work with sound credentials, in theory and method. It insists, however (and this is its distinctive feature), that a comprehensive psychology of man cannot be delimited by particular methods (experimental or statistical), any more than a cartographer can omit oceans or mountain ranges merely because he cannot traverse the former or scale the latter.

While recognizing, on the basis of evolution, man's kinship with animals, humanistic psychology acknowledges man's essential properties: his subjectivity and selfhood; his sense of past and future which makes him at once a creature of history and a dreamer; and his universal tendency to categorize in the form of moral and other value judgments. If all this evades the method of the laboratory it nevertheless claims the utmost precision of analysis, which does justice to the *phenomena* as such. The humanistic psychologist feels that neo-positivist insistence on methodological rigor is open to suspicion, and that all too often it is indistinguishable from *rigor mortis*.

Finally, humanistic psychology asks for a reappraisal of the division of labor, as between the sciences and humanities. Such a reappraisal should serve to show that psychology can profit equally from its affiliation with history, literature, comparative religion

and the arts, and from its links with neurophysiology and computer science.

Bibliography: Cohen, J.: *Humanistic psychology*. London, 1958. J. Cohen

II. Humanistic psychology is the name of a new school of psychology whose main founder was A. Maslow. In 1962 the American Association for Humanistic Psychology started with a nucleus of sponsors. A year before a *Journal of Humanistic Psychology* was edited by A. Sutich.

The main reasons for the initiating of what in a few years developed into a big movement, were originally purely scientific and theoretical. Those who joined in the foundation of what Maslow called the "third force" besides the then prevailing psychoanalysis and behaviorism, felt that none of these other schools did justice to the understanding of a healthily and creatively functioning person. They felt that such a person pursued goals and values not because of a need for "homeostasis", as the more recent psychoanalysis taught, but for the purpose of what Fromm and Horney called *self-realization*, or what K. Goldstein and A. Maslow called *self-actualization*, or C. Bühler called *self-fulfillment*, which she demonstrated in studies of courses of human life.

The school, which began with a small group of sponsors, developed and spread in a very short time to become a great movement. One reason was that Carl Rogers, one of the early sponsors, demonstrated the application of humanistic psychological ideas to *psychotherapy*. He showed a completely new type of relationship between therapist and patient, in which both related as persons, instead of one being an authority and the other a sick individual who had necessarily to transfer his early emotional conflicts with his parents, as psychoanalysis had taught. Of course, this problem is still partly in discussion, and there are different concepts and many experiments in which the handling of this relationship is developed. Rogers has

also the historical merit of having insisted on making tape records of psychotherapy sessions which could be made available to other therapists for inspection, comparison with their own work, and other studies. Up to then, the psychoanalysts had handled the process of therapy like an occult science which only the initiated were allowed to know about.

The opening-up of the therapy procedure to those who wanted to study it undoubtedly had many undesirable side-effects in that unqualified or semi-qualified people tried to conduct the process, and some extremists went very far in what they allowed to happen. These procedures occurred mostly in *group therapies*, which, since their early beginnings with Slavson and Moreno, had developed into the biggest movement of our time. The author considers group therapy and the related "*sensitivity training*", a group process in which people of all walks of life are assembled in groups learning to speak frankly with each other and trying to understand each other, one of the most hopeful cultural processes to take place in the present cultural crisis. Leading figures in the sensitivity training area are L. P. Bradford, J. Gibb, F. Massarik, and others who developed the procedure with industrialists, business men, administrators, educators and others.

This, as all that C. Rogers initiated, goes to show that psychotherapy is no longer considered exclusively or even primarily as a psychiatric procedure with the purpose of curing the mentally ill. Although a humanistic psychologist must be trained (and should be licensed by a supervising board) to treat neurotics, his main—and more frequent—task today is *educational* rather than curative. Together, the patient and therapist work on an understanding of themselves as *persons* and of *human life as a whole*.

Much work is just now being done in this area of educational psychotherapy. Important, however, is that humanistic psychology has gained a scientific foundation which *validates* its approach to the person as a whole, with

more scientific reliability than previous psychologies were able to. A recent first international congress, in Amsterdam, was devoted to this double issue of humanistic psychology's offering a new scientific approach to the study of the person as a whole (Maslow, Rogers, C. Bühler), and help in the renewal of our Western civilization so that it offers a better self-understanding and mutual understanding of people.

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Humanity. Traditionally, this term denotes a concept which covers both the totality of all characteristics innate in man and those which distinguish him from other living beings. It is used in particular to denote a moral-ethical attitude which is made up of altruism, love for one's fellow men and human understanding; it is the opposite of coercion and brute force. Since the eighteenth century, it has come to designate the revolutionary ideal of a reconciled mankind—a standard for the development of moral and political life (Declaration of Human Rights). A.T.

Human management. See *Management; Manipulation.*

Human nature, understanding of. A pre-scientific form of psychodiagnosis (q.v.), i.e. one lacking in objectivity, reliability, validity, and proficient standards. In popular language, a person who "understands human nature" is considered able to sum up an individual's personality, with particular reference to specific features—often on the basis of a first impression (q.v.). Experience is thought to be important in this "intuitive" process.

W.L.

Human placental lactogen (abb. HPL). A recently discovered extrahypophyseal gonadotropic hormone which is formed—like choriongonadotrophin(e) (q.v.)—in the placenta during pregnancy, and is similar in its effects to the hypophyseal gonadotropin: luteotropic hormone (LTH). In conjunction with other gonadotropins, HPL promotes the formation of hormones (estrogens and progesterone) in the *corpus luteum* of the ovaries and—like other placental gonadotropins—is most active in early pregnancy (second and third months).
H.M.

Human relations. A term for interpersonal relations in work or industrial organizations. Human relations research was founded in the nineteen thirties by E. Mayo, who conducted experiments in the Hawthorne Works (USA) in the course of which informal (unplanned) structures were “discovered” in industrial concerns, and the significance of psychological and social factors (satisfaction, group standards) for productivity was shown for the first time. The human relations movement attempts to increase productivity by improving the working atmosphere; it exaggerates, however, the importance of informal structures and disregards the conflict of interests between employers and employees. See *Hawthorne experiments; Occupational psychology; Industrial psychology*.
C.B.

Human rights. The inalienable fundamental rights of every human being: e.g. the rights to life, freedom and equality.
H.J.A.

Humor. 1. It would not be too extreme to claim that before Freud a real interest in the phenomenon of humor and the use of the term “wit” were not met with in psychology. Before the publication of Freud’s *Der Witz und seine Beziehung zum Unbewussten* (Vienna, 1905; Eng. trans., 1960), despite a few attempts to define the term (in particular,

those of T. Lipps and K. Fischer), it had no precise psychological connotation.

For Freud, everything that saves psychic or muscular effort is a source of pleasure. Pleasure *sui generis*, conditioned by a joke or witticism, corresponds to an economizing on mental effort. This saving is realized on two distinct levels: that of “matter” or background, and that of “form”. In terms of “matter”, the pleasure afforded by the joke corresponds to a saving of psychic effort resulting either from a moderation of the censorship exercised by reason on cognitive activity (when the adult becomes a “real child” once more, he plays quite freely with words and ideas without any concern for logical constraint), or from a moderation of moral censorship over our instincts (humor allows the satisfaction of a prohibited impulse). Another source of pleasure connected with the sense of humor and the exercise of wit is to be found at the formal level. Although accessory, this is by no means a negligible source, consisting as it does in (the study of) techniques for eliciting laughter or appreciation of humor. On the basis of a large number of famous jokes and witticisms, Freud provided a detailed list of various techniques: condensation (with or without substitute-formation), repeated use of the same verbal material, punning, logical inconsistency, representation by means of the contrary, unification, allusion, omission, etc. The only factor common to all these procedures is, according to Freud, a tendency to an economy of expenditure of semantic material.

Although interested mainly in *wit*, Freud in fact represents his theory in the form of the threefold complex of *wit* (jokes), the *comic*, and *humor*. This division relies on the different underlying genetic processes: “The pleasure of wit seems to me” to arise from “an economy of expenditure of inhibition; that of the comic from an economy of expenditure of representational thought; and that of humor from an economy of expenditure of feeling.”

However, as far as the last two terms are concerned, no consensus of opinion is as yet available among psychologists on their precise denotations. For Freud, humor corresponds to the economy of expenditure of a painful emotion, and therefore constitutes a means of defense against pain. For Bergson, humor is defined in contradistinction to *irony*: I am humorous when I pretend to believe that things are not as they really are, but instead as they ought really to be. "Humor" is, of course, generally used in a less precise way, and as a global term, in English: i.e. something humorous is something in any way laughable or amusing.

Bergson defines the basis of the comic as arising from the contrast between the mechanical and the organic ("*le vivant*"); he believed that comedy "is not disinterested as genuine art is. By organizing laughter, comedy accepts social life as a natural environment, it even obeys an impulse of social life. And in this respect it turns back upon art, which is a breaking away from society and a return to pure nature." Despite Bergson's insistence that all comic incongruities are examples of mechanization, the word "comic" is still without any precise psychological connotation, and has a different signification for each author. Victoroff (1953) suggests that the comic should be defined in contradistinction to the *ridiculous*, or laughable: one may elicit laughter quite intentionally, or, on the contrary, involuntarily—even bringing it upon oneself. In the first case, the comic is in question, and in the second case the ridiculous (ridicule).

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D. Victoroff

2. The concept of humor is derived from C. Galenus' theory of temperaments (tempera-

ment as a mixture of "humors") and is used today: (a) in the sense of a cheerful and comprehensive attitude to life or a basic mood and (b) as a generic term for verbal, graphic or pantomimic expressions designed to provoke mirth and laughter (sense of humor). Factor analyses of opinions regarding humorous material showed that the sense of humor consists of at least six factors which are partly correlated with personality traits. Associations of this kind form the basis of the IPAT Humor Test of Personality (R. B. Cattell). D.B.

3. A distinction is sometimes made between *personal* or *orectic* (affective, conative: e.g. sex) and *impersonal* or *cognitive* (formal) aspects of humor (e.g. Kambouropoulou, 1926, 1930). Williams (1945) and Eysenck (1947) found evidence of a correlation between extraversion and preferences for orectic humor, and between introversion and preferences for cognitive humor.

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Humphrey's paradox (syn. *Arpeggio paradox*). The tendency of organisms to react to specific categories of stimuli in an identical manner, even though the objective characteristics of the stimuli vary; or the tendency of individuals, who would otherwise react differently to a specific tone, to respond identically when that tone is produced not simultaneously but in sequence, e.g. in an arpeggio. See *Generalization*; *Stereotype*. H. Ro.

Hunger. Normally refers to the desire to eat (which may or may not be associated with food deprivation), but is also used in a

metaphorical sense to refer to a craving for anything, e.g. sex or affection.

Hunger drive: a hypothetical state operationally defined in terms of food deprivation, which is found to give rise to increased general activity as well as specific food-seeking behavior. (See *Instinct*.)

Hunger pangs: unpleasant sensations in the stomach associated with the need for food, and believed to be associated with contractions of the stomach wall.

Hunger-strike: refusal to eat as a means of bringing political pressure to bear upon an authority, e.g. prisoners attempting to gain improved conditions. *G.D.W.*

Husserl. See *Phenomenology*.

Hybridization. Crossing or interbreeding. In diploid (q.v.) organisms, a distinction can be made between the phenotype (q.v.) and genotype (q.v.). Individuals with pure heredity (homozygotes) have one identical allele on each (the maternal and paternal) side. Mixed hybrids (heterozygotes) differ in one gene (monohybrid), or in two (dihybrid), or three genes (trihybrid), etc. Depending on the phenotype, hybrids may be intermediate or dominant/recessive. *K. Fi.*

Hydrazines. Amine oxidase inhibitors which over a period of a week or more have a stimulant effect on mood, which would seem to correspond to the MAO inhibiting effects of the substances. Some toxic side-effects reported, e.g. with iproniazid. Hydrazines have been tried in depression (q.v.), but have now for the most part given way to dibenzazepines. See *Psychotomimetic drugs*.

Bibliography: Garattini, S. & Dukes, M.: *Anti-depressant drugs*. Amsterdam, 1967.

Hydrocephalus. An increase of cerebrospinal fluid (csf) within the skull, usually associated

with an increase in pressure. It may result from an obstruction to the flow of csf within the ventricular system, or a decreased absorption of the fluid. When it occurs in children an increase in the size of the head may follow, but in the adult this cannot occur, so that neurological and mental symptoms develop as a result of intracranial pressure. In the past, mental deficiency was a common complication in untreated cases in children, although nowadays drainage operations are possible. *D.E.*

Hydrocortisone (*Cortisol*; 17-hydroxycorticosterone, abb. 17-OHCS; *Cortef*; *Cortril*; *Efcortisol*; etc.). The most important hormone (q.v.) in the adrenal cortex; belongs to the group of glucocorticoids. Hydrocortisone is very important in psychophysiological emotion research because it can be detected relatively easily and accurately (e.g. by chromatography) in the blood plasma and urine. Many studies in animals and in diseased and healthy testees have shown that all kinds of stress stimuli are associated with increased hormone secretion. Because of the high inter- and intra-individual variance, fairly large samples are often necessary to inform on significant effects. Adequate reliability can only be achieved if many factors are observed (e.g. time of day, age, sex, weight, nourishment, etc.). If these factors are taken into consideration, hydrocortisone is a sensitive indicator even for light and short-term stressors. The administration of hydrocortisone in physiological doses has only a slight effect, but experimentally induced emotions are heightened. The basal values of hydrocortisone secretion are relatively constant in a given individual. Correlation studies with personality traits show that male and anxious testees have higher values than female and non-anxious subjects. In depressive patients, hydrocortisone secretion increases with the severity of the disorder, but negative results have also been observed. See *Corticosteroids*. *W.J.*

5-hydroxytryptamine. An abbreviation for the chemical composition of serotonin (q.v.).

5-hydroxytryptophan(e). The chemical precursor of serotonin (q.v.). The conversion of 5-hydroxytryptophane into serotonin in the organism takes place under the influence of the enzyme 5-hydroxytryptophane-decarboxylase. This conversion can be blocked by specific substances, such as P-chlorophenylalanine. 5-hydroxytryptophane, unlike serotonin, passes the blood-brain barrier (q.v.). It is therefore of considerable importance for experimental or therapeutic manipulation of the serotonin concentration in the brain. See *Biogenic amines*. W.J.

Hygiene, mental. See *Mental hygiene*.

Hypalgesia. Hypalgesia denotes a raising of the pain threshold. This phenomenon may be explained, e.g., by the degeneration of certain nerve fibers in the affected skin area. Once the raised threshold is exceeded, the pain experienced is often even greater than normal (hyperpathy). See *Pain*. M.S.

Hyperacusis. Abnormally raised sensitivity to loud sounds: may be due to paralysis of the stapes muscle, which should normally raise the base of the stapes slightly above the oval window of the cochlea on exposure to extreme sound energy (protective function). Hair cell damage at high intensities is sometimes accompanied by hyperacusis. M.S.

Hyperal(ges)ia. If the pain threshold is lowered, even light contact may be experienced as painful. In general, the damage is confined to a limited area and the pain is described as "burning". M.S.

Hyperbolic type. Ant. hypobolic type or litotes type (see *Speech types*). The hyperbolic type uses drastic and exaggerated language, while the litotes type tends to underemphasize. W.K.

Hyperemia. Excess of blood in some part of the body, due to reactive capillary dilatation under mechanical, thermal or chemical excitation, as part of an inflammation, or in a case of venous obstruction, etc. E.D.

Hyperesthesia. Increased cutaneous sensitivity due to peripheral or central changes. See *Hyperalgesia*. M.S.

Hyperesthetic type. An extreme variant of the schizothymic character: "fickle sensitivity . . . fanatic enthusiasm for nature and art (or) persons . . . easily influenced and hurt . . . reacts oversensitively to ideas with a strong emotional coloring, tends to stick to them vehemently and for a long time." Ant. *Anesthetic type*.

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Hyperfunction(ing). The overfunctioning of organs. Often pathological and referred to by specific medical terms. The commonest condition of this kind is a hyperfunctioning of the endocrine glands. The thyroid gland is responsible for Basedow's disease (q.v.) with accelerated metabolic processes, exophthalmus and nervousness, while the adrenal gland may cause the Cushing syndrome with the following symptoms: "moon face", facial reddening, striae (pregnancy marks) and blood pressure crises. The pituitary may cause acromegaly or gigantism. Treatment is generally only possible by partial destruction of the glandular tissue. E.D.

Hypergeometric distribution. A hypergeometric distribution of sample values for a discrete variable is obtained by extracting X_1 elements from a finite population *without* replacement. The probability (anticipated relative frequency) of a result of exactly X occurrences of a given alternative ("successes") in a population of N elements—including M "successes"—with a sample size of n , is obtained from:

$$p(x) = \frac{\binom{M}{x} \binom{N-M}{n-x}}{\binom{N}{n}}; \text{ for } x = 0, 1, \dots, N.$$

The hypergeometric distribution plays the same part in samples without replacement as the binomial distribution (q.v.) for samples with replacement. It has the mean value:

$$\mu = n \cdot \frac{M}{N},$$

and the standard deviation:

$$\sigma = \frac{n \cdot M(N-M)(N-n)}{N^2(N-1)}.$$

W.H.B.

Hypergonadism; hypogonadism. In general: over- (hyper-) or under- (hypo-) functioning of the male or female sex glands with various causes. Hypogonadism is far more frequent than hypergonadism (ratio 8:1). Hypergonadism occurs very rarely when the gonadotropins (extremely uncommon) or sex gland hormones are produced in excessive quantities because of a tumor, so that there is a strong development of the secondary sexual characteristics (this does not, however, include premature puberty = see *Pubertas praecox*).

Hypogonadism plays a much more important part in clinical practice, clinical psychology, and psychopathology. A distinction is made between two main groups according to the dominant effect:

1. *Primary, hypergonadotropic hypogonadism.* Primary failure of the terminal organ (testicles, ovaries) while the regulating organs (hypophysis, hypothalamus) remain

intact; also excessive production of gonadotropic hormones because of impaired functioning of the sex glands. Causes: in both sexes, chromosomal anomalies are the principal cause. Main forms: (a) in the male: Klinefelter syndrome; other hereditary testicular malformation syndromes, e.g. Reifstein and male Turner syndrome are relatively uncommon; (b) in the female the prototype is the Turner syndrome; (c) special case of failure to mature in persons with external female characteristics, but primarily male sex, and failure of testicles to descend: testicular feminization syndrome.

2. *Secondary, hypogonadotropic hypogonadism.* Diminished formation of gonadotropin caused by factors in the hypophysis (q.v.) or hypothalamus (q.v.) which results in failure of the sex gland functions or even to failure of these functions to develop. Much rarer than forms of primary gonadic hypofunction. Main forms: (a) idiopathic eunuchoidism = failure of FSH and ICSH formation, with the result that puberty does not occur even though the testicles are essentially intact; (b) fertile eunuchoidism (Pasqualini syndrome); probably isolated disturbance of ICSH production with intact FSH production; so that a eunuchoidal physique with infantile genitalia develops, while the testicles reach almost normal size with well-developed spermiogenesis; hypogonadism without marked hypogonadism (a very rare condition); (c) pituitary dwarfism. In all these forms puberty fails to occur and—unless treated—the patient remains sexually infantile. In addition, there is a secondary form of hypogonadism which is not innate but is acquired during the course of life (=postpuberal hypogonadism) as a partial symptom of complete failure of pituitary functions, generally caused by tumors of the hypophysis.

Chronic failure to reach puberty is more common in men than women. The psychological problem consists essentially in the need as far as possible to avoid any discrepancy between chronological age and

social maturity, in spite of biological and physical retardation (childishness and immature appearance). Clinical-psychological and sexual guidance—especially in cases of infertility—are urgent necessities in such cases.

Bibliography: Wilkins, L.: The diagnosis and treatment of endocrine disorders in childhood and adolescence. Springfield, Mass., 1965. *H.M.*

Hyperkinesis. Abnormally excessive motility of limbs and parts of the body, caused by continuous (tonic) or intermittent (clonic) muscular contractions, which are sometimes painful; the contractions often take the form of cramp. They are due to pathological changes in the brain areas controlling movement: e.g. *nucleus niger, ruber* or the cerebellum (q.v.). *E.D.*

Hypermetropia. Long sight. Incident light rays are reflected only behind the retina. (a) *Axial hypermetropia*: the bulbus is too short. (b) *Refractive hypermetropia*: refraction of the light rays is insufficient. The condition can be corrected by means of convex lenses. *R.R.*

Hypermnesia. An unusually good memory (q.v.), often due to abnormal mental states of excessively acute awareness. In hypnosis (q.v.) the subject may often recall events which occurred in the distant past, but only to the extent of a heightening of the possibilities which are already present in the normal state. *Hypomnesia* = poor memory, impaired ability to recall events. *H.-N.G.*

Hypermotility. Compulsive movement, motor unrest, or exaggerated mobility of the limbs and joints, e.g. in many forms of mental deficiency. *E.D.*

Hyperopia. See *Hypermetropia*.

Hyperosmia. An extremely acute sense of smell, especially as a pathological heightening of sensitivity, e.g. in pregnancy, neurasthenia (q.v.), epilepsy (q.v.); generally due to a central cause; the mechanism is not, however, clear. *K.H.P.*

Hyperplasia. An abnormal increase in the number of cells in organs or parts of the body, sometimes associated with hyperfunctioning (q.v.). Hyperplasia is sometimes pre-cancerous and is generally caused by excessive stress or strong stimuli. *E.D.*

Hypertension. Abnormally high tension, generally used to denote high blood pressure. See *Hypertonicity*. *E.D.*

Hyperthymia. A personality trait or type characterized by cheerfulness, high activity and industry. Distinguished from *hypomania* (q.v.) by a lack of social complications and of any necessity for medical or legal restraint. The opposite pole from *dysthymia* (q.v.); together they constitute the cyclothymic personality type, which changes from one state to the other. Manic depressive patients as a group have an excess of hyperthymic or cyclothymic personalities when assessed retrospectively. Prospective studies of hyperthymic personalities who develop the psychosis are not available, and there is no evidence of any alarming relationship. *B.B.*

Hyperthyroidism. See *Basedow's disease*.

Hypertonicity (or *Hypertension*, q.v.). High blood pressure due to a variety of causes. A distinction is made between several forms of hypertonicity. Genuine red high pressure (red facial coloring) is based on constitutional factors with neural components. Pale renal high pressure (white facial coloring)

is due to vascular contraction with hormonal causes, deriving mainly from kidney damage. Thyrotoxicosis, Cushing syndrome (hyperfunction of the adrenal cortex), or adreno-genic symptoms (overfunctioning of the adrenal medulla) are other possible causes. All forms of hypertonicity eventually lead to hypertrophy (q.v.) and damage to the cardiac muscle, as well as vascular sclerosis. *E.D.*

Hypertrophy. Excessive development of overloaded organs, e.g. the muscular system in athletes, the heart in cases of high blood pressure, or the uterus in pregnancy, without an increase in the cell count. These are all conditions of physiological or activity hypertrophy. On the other hand, the various pathological forms of hypertrophy, e.g. hypertrophy of the prostate gland or tonsils, are disease conditions. See *Hyperplasia*.

E.D.

Hypnagogic hallucination. See *Sleep*.

Hypnoic mechanisms. Involuntary "functional forms" of the imagination which do not have a logical or objective basis but an emotional or subjective foundation and are reflected in (internal) "images" and in acts of expression (spheric dependence, blurring of the ego boundary, change in time and space relationships, heightened density, displacement, stylization, "picture strip" imagination, etc.).

W.K.

Hypnolepsy. A state of abnormal sleepiness. The term is usually employed as a synonym for narcolepsy (q.v.).

J.P.

Hypnopedia. In hypnopedia (from the Greek = education in sleep) the pupil is taught and given behavioral instructions in a hypnotic state in order to avoid difficulties in absorbing information and controlling behavior while he is awake. Experimental results confirm

the possibility of teaching and learning in sleep, but precise data on increased effectiveness obtainable through hypnopedia are not available as yet.

H. Schr.

Hypnophobia. An undue fear of sleep.

Hypnosis. "A temporary condition of altered attention in the S. which may be induced by another person and in which a variety of phenomena may appear spontaneously or in response to verbal or other stimuli. These phenomena include alterations in consciousness and memory, increased susceptibility to suggestion and the production in the S. of responses and ideas unfamiliar to him in his usual state of mind. Further, phenomena such as anaesthesia, paralysis, and rigidity of muscles, and vasomotor changes can be produced and removed. . . ." (B.M.A., 1955, p. 191).

Hypnosis, hypnotic state, hypnotic trance, and hypnotism are often used interchangeably, but hypnotism may also refer specifically to *hypnotic induction* by a *hypnotist* or *operator*. *Susceptibility* is the degree to which a S. is affected by induction, and determines the *depth* of hypnosis achieved. *Hypnoidal* refers to states having at least some of the characteristics of light hypnosis.

Posthypnotic suggestions (and instructions) are made during hypnosis in order to influence the S. after hypnosis, whereas *posthypnotic phenomena* are consequences of hypnosis arising after its termination, including those resulting from posthypnotic suggestions. There may be spontaneous or induced failure of the S. to remember some or all of the events which took place during hypnosis (*posthypnotic amnesia*), and even having been hypnotized. In so far as a S. can hypnotize himself, we have *auto-hypnosis*.

Hypnosis derives from "neuro-hypnotism", a term introduced by Braid (1843) to denote a trance-like state he observed to result from prolonged visual fixation or from prolonged

concentrated attention of other kinds (*monoideism*), and resembling the *sleeping-trance* described by de Puységur (1785) as resulting from the prolonged use of mesmeric passes. The fully-developed trance resembled very deep sleep, with the S. stuporous and unresponsive to stimuli. Somewhat similar states have been reported from ancient times as arising in man, often following prolonged exposure to repetitive stimuli such as rhythmic drumming and chanting. Possibly analogous states are observed in many higher animals after exposure to repetitive stimuli such as stroking and flashing lights, and to sudden inversion, forcible restraint, and pressure on body parts; hence the terms *hypnosis* and *hypnotic trance* are sometimes applied to all such trance-like states in animals and men. However, the important characteristics of sleeping trance and neurohypnosis were that if the operator started speaking to the S. while the trance was still very light, and continued to talk at frequent intervals as it deepened, a selective *rapport* developed, the S. remaining responsive to the operator's verbal suggestions yet becoming progressively less responsive to all other stimuli. The term hypnotic trance is best reserved to denote sleeping trance and similar states as modified by the effects of verbal suggestion, in which sense the hypnotic trance can be induced only in humans with at least a rudimentary command of language.

In his later work, Braid increasingly stressed the power of *monoideism* (resulting from concentrated attention to the operator's suggestions) to induce hypnotic trance without the help of such techniques as visual fixation. He showed that the operator's suggestions and the S.'s expectations both exerted a profound effect on the phenomena elicited during hypnosis. Liébeault and Bernheim stressed the role of such purely psychological determinants of hypnosis to the virtual exclusion of all others: "If you use suggestibility to suggest suggestibility, the result is hypnotism." But some modern

work supports Braid's original view that visual fixation can lead to increased suggestibility even in the absence of suggestion or expectation.

The development of hypnosis as a field of study in the context of medicine and psychology dates from Mesmer's claims of therapeutic effects resulting from a form of convulsive seizure (*crisis*) apparently induced by magnets or (later) by mesmeric passes, and from the observations and experiments of those who sought to prove or disprove these claims. The deliberate use of direct verbal suggestion played no part in the early practice of Mesmerism, or in Mesmer's own theories.

1. *Induction and termination.* Detailed descriptions of a wide variety of induction procedures are readily available (e.g., Weitzenhoffer, 1953). The essential characteristic of most is continuous repetitive verbal suggestions, directed by the operator to the S., and normally at first designed to produce relaxation, attention to the operator's voice, drowsiness and eye closure. Subsequently, some degree of response having been observed, the operator may invite the S. to try moving his limbs gently, while at the same time confidently asserting that he will experience great disinclination and difficulty in doing so. Suggestions that the limbs, fingers, and so on, will move in specified ways without the volition of the S., and that sensations such as warmth or numbness will be experienced, may follow. Most operators believe that a crucial stage in increasing depth of hypnosis is reached when *challenge suggestions* are made, e.g. by telling S. that he will be unable to open his eyes no matter how hard he tries, and that the more he tries to open them, the more tightly they will close. Beyond this stage, the hypnosis may be said to be firmly established, and responses to further suggestions may be almost immediate, without the need for repetition; but there is no clearly marked stage at which induction can be said to terminate and the elicitation of the phenomena of hypnosis to

begin. Induction is normally a process of eliciting a continuing series of responses which themselves also constitute the phenomena, to a succession of suggestions of steadily increasing "difficulty". In a proportion of Ss., suggestions that the lethargy of the early stages is to give place to an active state with eyes open, in which strong rapport and hypersuggestibility are nevertheless retained, may be successful (*somnambulism*, q.v.). Most operators combine visual and/or auditory fixation with verbal suggestions in the initial phases of induction, but this is not essential and it is not known how much it influences rate or depth of hypnosis. Termination usually occurs when the operator commands S. to return to his normal state, specifically countermands suggestions judged to merit this, and suggests that feelings of alertness and well-being will follow the "awakening". Some Ss. may complain of disorientation and feelings of unreality, and perhaps drowsiness, for a period in which it will be exceptionally easy to re-hypnotize them. Suggestions made during hypnosis, that it will be easy to induce hypnosis again, are normally so effective, that subsequent inductions may be made almost instantaneously on an agreed signal from the operator.

2. *Susceptibility*. Suggestions can be arranged approximately along a scale of "difficulty" in the sense that if a person responds to a suggestion with any particular difficulty he is likely to respond also to all easier suggestions, whereas if he fails to respond it is unlikely that he will respond to any that are more difficult. Lists of suggestions in order of difficulty are available for measuring the depth of hypnosis achieved with any particular S. Depth tends to increase throughout the duration of any single hypnosis, and with each subsequent hypnosis, up to a maximum which differs markedly from one S. to another. Most research suggests that this maximum is not usually greatly influenced by the personality or technique of a particular operator, or by a variety of environmental factors, but there

is also clear evidence that it sometimes may be. Many investigators report that about ten per cent of European adults are insusceptible, and that somnambulism can be achieved with between twenty and thirty per cent. Above-average susceptibility is more frequently found in women, and is positively correlated with high intelligence, some kinds of waking suggestibility (e.g. Eysenck's primary and tertiary suggestibilities) but not others, a tendency to vivid day-dreams and states of self-absorption, a capacity for vivid imagery, a positive attitude to the idea of being hypnotized, and addiction to narcotic drugs. A variety of relationships between susceptibility and a number of personality characteristics (particularly extraversion) have been reported, but the results of one investigation have seldom been confirmed by another: therefore it has been suggested that relationships are different for high-drive and low-drive (or high anxious and low anxious) subjects, and for men and for women. In children, susceptibility increases with the mastery of language and at about eight to ten years reaches a maximum before declining somewhat to a stable value maintained throughout maturity. Some forms of psychoneurosis may be associated with above average susceptibility, and most psychotic illness with low susceptibility, but the naturally occurring differences between normal Ss. are much larger than those between averages for groups of neurotics and normals.

3. *Phenomena*. A distinction can in principle be made between phenomena resulting from induction of itself, and those depending on specific suggestions to the hypnotized S. There is, however, ample evidence that the expectations of the S. and unintended indirect suggestions from the operator profoundly influence response to induction, so that the intrinsic characteristics of the state are difficult to elucidate. Orne has referred to the *demand characteristics* of the hypnotic situation, being the totality of the intended and unintended cues which influence the S.'s responses. He believes that the essential

characteristics of hypnosis reside in the experience of the S., rather than in his directly observable responses, and that they relate to the distortions of normal logic and normal perceptual organization which have to take place before the operator's suggestions can be accepted.

Success in demonstrating phenomena resulting from specific suggestions varies markedly from one S. to another. Among the well attested phenomena which have survived careful experimental investigation are: *responses of voluntary musculature*, inception and inhibition of contraction; paralysis resulting from simultaneous activation of opposing muscle pairs; increased tolerance of fatigue and discomfort arising from muscular activity, and thus sometimes apparently increased strength (e.g. grip) and/or work capacity; improved muscular control in relatively simple motor skills, but probably not in more complex ones; *physiological phenomena*, increased metabolic rate in relaxed S. during suggestions that muscular work was being undertaken; inhibition of hunger contractions and increased gastric acidity following suggestions that food was being eaten; changes in pepsin, trypsin, lipase and maltose production appropriate to suggested ingestion of protein, fat and carbohydrate respectively; *hallucination of sense*, absence of startle reflex and psychogalvanic reflex (PGR) on exposure to sudden loud noises or flashes following suggested deafness or blindness; appropriate changes in response to Ishihara test cards following suggestions of color-blindness; abolition of normal reactions (including PGR) to painful stimuli (including surgical operations) following suggested anesthesia or analgesia, and interruption of withdrawal reflex at level of first spinal synapse on application of noxious stimulus to hypnotically anesthetized skin; appearance of nystagmus following suggested hallucinations of rotation in a centrifuge.

4. *Memory*. Appropriate specific suggestions can often produce a post-hypnotic amnesia for material learned, or events

experienced at any time before or during the hypnosis; and some degree of amnesia for the events of the hypnosis may also arise spontaneously. In so far as conditioned reflexes constitute a form of memory, it should be noted that they seem not to be abolished by direct suggestions, although the conditioned response may fail to appear after suggestions that the conditioned stimulus cannot be perceived. Hypnotic hypermnnesia may involve (a) enhanced capacity to recall previous experiences (particularly those with strong emotional content) extending to complete recovery of repressed traumatic memories, or (b) improved recall of learned material, but probably only if it is meaningful, e.g. a poem or logical argument rather than an arbitrary list of words.

5. *Revivification* seems to involve the partial re-establishing of the complete psychophysiological state existing at some time in the Subject's past. Thus in *age regression* the S. may be told that he is again an infant and may then spontaneously exhibit neo-natal reflexes such as reversed Babinski, defecation when startled, together with appropriate alterations in peripheral chronaxie; however, many responses to suggested hypermnnesia and revivification are no more than plausible dramatizations of fantasy; *personality alterations*, simple changes in mood and emotions are readily induced but are often difficult to sustain post-hypnotically. Habit changes (e.g. smoking) are often short-lived but may be extended by frequent hypnosis (e.g. daily) over prolonged periods. There are reliable reports of successful experiments in the development of multiple personalities. *Organic changes* are particularly difficult to explain, but there is fair evidence for the occasional production by specific hypnotic suggestion of a variety of allergic and psychosomatic skin changes, and of skin blisters in Ss. of hysteric personality. There are also reports of such phenomena during or following abreaction, under both hypnosis and drugs. Some investigators believe that stigmata may also be produced.

6. *Hypnotherapy* is a term used rather loosely to denote several different therapeutic applications, e.g. (a) prolonged hypnotic "sleep" used sometimes for gastric and duodenal ulcers, hypertension, cardiac disease, and other conditions where prolonged periods free from stress might be beneficial; (b) *hypnoanalysis*, where classical psychoanalytic techniques are modified and shortened by using hypnosis to facilitate the emergence of memories and associations which are being repressed; (c) the production of cathartic abreactions, usually during revivification, as part of the treatment of post-traumatic neuroses in an attempt to relieve conversion and other symptoms such as paralysis; (d) direct suggestions oriented toward the relief of specified physical or mental symptoms without attempting to influence any possible underlying causes. Among the most frequently used applications, this is also the most controversial, as many psychiatrists claim that symptoms which can be removed by suggestion serve unconscious needs and help preserve the patients' psychological equilibrium. If removed without regard to etiology, substitute symptoms may soon be generated or, if not, the stability of the personality may be threatened. An influential body of psychiatric opinion, however, regards symptom removal as beneficial. Among conditions treated with apparent success have been addictions, asthma, excessive appetite, eczema, irritable bladder, stress incontinence, homosexuality, impotence, menstrual disturbances, vaginismus, headaches, stammering, warts, phobias, and conversion neuroses. There has been little success with psychosis. In Mason's celebrated case of congenital ichtyosiform erythrodermia of Brocq, the photographic and clinical evidence showed that skin characteristics improved only in the limb to which the hypnotic suggestions were specifically directed.

7. *Other medical and dental applications.* The most common is probably the production of analgesia and relaxation during childbirth; the duration of labor may be

reduced when this is done. Some practitioners, particularly in dentistry, use hypnosis for the alleviation of anxiety before and during treatment, and for the production of analgesia or anesthesia where using chemical agents would be difficult, inconvenient or dangerous. With some patients suffering intractable pain (e.g. in terminal cancer) hypnosis affords substantial alleviation without the side effects of chemical agents.

8. *Theories.* It is tempting to impose a classification of theories of hypnosis into two types—(a) those which explain the phenomena as a consequence of a special state of the central nervous system (or more generally, of the subject's condition of neuropsychological organization) usually generated by the induction, and (b) those which explain them as examples of the organism's normal functioning under unusual conditions of motivation, attention, expectation, and attitude, these last being influenced by the induction but by no means essentially dependent on it.

Theories of the first kind include the long established explanations of hypnosis as a form of sleep. However, in respect of a variety of measures of physiological indices such as reflexes, blood-pressure, electrical activity of the brain, oxygen consumption, etc., hypnosis has been shown to resemble wakefulness far more than sleep. There is however some evidence, particularly from electro-encephalographic studies, that it may be a specialized form of very light sleep, clearly distinguishable from both wakefulness and deep sleep. From his work on conditioned reflexes, Pavlov explained hypnosis as a state of generalized cortical inhibition within which the existence of islands of continuing excitation makes it possible to evoke responses whose bizarre characteristics result from the absence of control and modification by the cortex as a whole. Rather more vague theories speak of an inhibition of activity in the white matter of the cerebrum (Bennett), an inhibition of ganglionic cells, and a state of anemia of the frontal lobes (Völgyesi).

Janet viewed hypnosis as a state of simple or multiple dissociation in which the stream of consciousness splits into components functioning relatively independently of one another. It is tempting to see this as the psychological analogue of Pavlov's physiological explanations.

Theories of the second kind include the formulations of Bernheim and Liébeault, who saw the phenomena as special examples of waking suggestibility, produced by suggestion. Such formulations indicate the need for a theory of suggestion rather than, or as well as, of hypnosis. It is known that if the normal waking S. just thinks about certain forms of muscular activity, including speech, then very attenuated nervous impulses, appropriate to the production of that activity, are automatically generated. Such *ideomotor action* is held by some to be a sufficient basis for a theory of motor suggestibility, but it is obviously insufficient to explain the whole range of hypnotic phenomena. Conditioned reflex theories assert that the links between words and the subject's responses in hypnosis are of the same kind, and obey the same law, as those between the conditioned stimulus and the conditioned response in Pavlovian reflexology. Other theories stress the relational aspects of hypnosis. Ferenczi viewed the phenomena as resulting from a psychological regression to the infantile state of dependence on and conflict with the parents, while Freud emphasized the importance of submission, and spoke of the hypnotic relationship as the devotion of someone in love to an unlimited degree, but with sexual satisfaction excluded. More recently, Sarbin has suggested that hypnosis is a highly motivated form of role-playing. The steadily increasing evidence that most if not all kinds of hypnotic phenomena can also be demonstrated with Ss. who have not undergone induction, emphasizes the importance of theories of this kind, though not necessarily of these particular theories.

While all the formulations direct attention to interesting analogies which might help in

the generation of hypotheses, none really merits the status of a theory or seems substantially explanatory or predictive. The hypnotized S. functions in modes at least as complex as does the waking S., and it is doubtful if an all-embracing "theory of hypnosis" is possible. When more is known about the determinants of normal waking activity, it should be possible to establish how these are modified in hypnosis, and in particular whether there is a specific "hypnotic state".

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W. D. Furneaux

Hypnosis research, experimental. The experimental study of hypnosis promises not only to explain a phenomenon which is interesting in itself, but also to give new insight into hitherto unsolved general psychological problems, since hypnosis allows experimental access to human experience and behavior at different levels of consciousness (see Ullmann et al., 1968; Ullmann, 1971). The progress obtainable through research into hypnosis extends to such general psychological themes

as cognition, perception, emotion, motivation, interpersonal relations (Barber, 1969; Orne, 1970, etc.), personality and social adaptability (McGuire, 1968), pain (Hilgard, 1967) and placebo effect (McGlashan *et al.*, 1967), and leads into central problems of psycholinguistics (q.v.) (Sarbin & Coe, 1971).

Experiments conducted by Orne (1959, 1962) have not only given useful information on problems of hypnosis as such, but have demonstrated the general influence of the experimental situation on the testee; a distinction must be made between general behavior and the specific behavior studied in a given experiment. The methodological developments of modern hypnosis research therefore go beyond the narrower subject of study (Gordon, 1967). This also applies to study of the problem of hypnotic trance. The conflicting interpretations of altered states of awareness as legitimate or impermissible constructs express the basic scientific positions of contemporary psychology (Barber, 1969, 1970; Hilgard, 1969, 1970; Sarbin, 1968; Spanos & Chaves, 1970; H. Thomae, 1962; Ullmann & Ullmann, 1966) and form the bases of paradigms of hypnosis experiments.

Sarbin and co-workers have tried to explain the phenomenon of hypnosis exclusively with the aid of social and psychological theorems; hypnotic behavior is considered in the context of a psychology of communicative influences (Sarbin & Coe, 1971), and examined empirically. In Sarbin's opinion, the experience of a trance state is not necessarily based on an objective equivalent as the cause of hypnotic phenomena. Barber adopts a similar approach; in his opinion there is no special hypnotic "state of consciousness; that would be a superfluous construct which would not help one to arrive at a more comprehensive appraisal of the problem. Efforts to analyze hypnotic behavior (dependent variables), and the objective parameters which condition such behavior (independent variables), as well as the laws governing relationships between these two sets of variables in

quantitative terms, are characteristic of the procedure adopted. The forms of hypnotic behavior which are to be explained, such as (a) behavior in response to direct suggestions, e.g. hallucinations, analgesia, amnesia, etc., (b) the verbal statements of the testee, and (c) symptoms resembling a state of trance (lack of spontaneity, retarded motor behavior), are analyzed quantitatively with the help of a standardized scale (BSS: Barber, 1965). As regards the antecedents which play a significant part in the occurrence of hypnotic behavior, Barber and co-workers have identified a number of variables which are classified as (a) instruction-suggestion variable, (b) subject variable, (c) hypnotizer variable, and (d) relationship variable (Barber, 1969). It has frequently been found that individual phenomena which occur in hypnosis can be brought about even without hypnotic induction. Barber views this result as supporting his rejection of a special hypnotic state of trance.

According to Hilgard (1965, 1969, 1970), hypnotic phenomena can in part be considered in a different light. From his standpoint of modern functionalism, subjective conditions are a legitimate object of scientific study. Referring to sleep research (see *Sleep*), Hilgard considers it desirable to distinguish between different states of consciousness. He considers that objective indicators should exist for the state of hypnosis as they do for the sleeping state. Apart from trance problems, Hilgard and co-workers have not only studied the use of hypnosis to lessen pain (Hilgard, 1967), but have developed their own scales to examine hypnotic suggestibility as an individual trait, especially from the genetic angle. In Hilgard's opinion, this characteristic can be modified by a series of variables, e.g. by expectancy attitudes of the test subject, or by adjusting the test suggestion (Barber, 1969), but results obtained so far show that this feature is relatively stable in a substantial number of cases. Like Hilgard, P. London (1970) considers the persistent proportion of individual differences in

hypnotic performance to be important and attempts—as a basis for a theory of hypnosis—to find appropriate correlates. London considers that there is an empirical basis for the relationship with motivation and EEG (q.v.) patterns. Hilgard believes that the justification for abandoning the normal paradigm and examining a parameter considered in it as a dependent variable, i.e. hypnotic suggestibility, as an independent variable, lies in the additional information likely to be obtained, which can help to define important parameters in more detail.

To sum up, it can be stated that modern experimental hypnosis research is characterized by a high level of experimental plans and techniques. Some representatives of different theoretical schools have tried to determine the validity of their methods in a logical manner; it seems that the validity of the different individual positions will be clarified in the next phase of experimental activity. After the identification of several significant variables and analyzing the relationship between a number of such variables, hypnosis appears as an extremely interesting phenomenon in the broader context of general psychological studies.

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J. F. Ullmann, I. M. Ullmann & W. H. Klapp

Hypnotics. Natural or synthetic substances which lead directly to a condition similar to sleep or facilitate its occurrence. Desirable properties: generation of a state which resembles natural sleep as closely as possible without secondary and aftereffects (hang-over); no cumulative effect, habituation, or development of dependence; large therapeutic range to prevent serious risk in the event of an overdose. The hypnotics include various groups of chemical substances (some of which are no longer in use today) such as the alcohols and aldehydes (ethyl alcohol, chloralhydrate, paraldehyde), sulfones (sulfonal, methylsulfonal), urethanes (ethyl-urethane, ethinamate), monoureides (Bromisoval, Carbamal), cycloureides (barbiturates) and piperidine derivatives (gluthethimide, thalidomide). It is difficult to draw a clear distinction between the hypnotics and the tranquilizers (q.v.) and narcotics (q.v.). The opinion that there are only quantitative differences (Irwin, 1968) contrasts with the assertion of qualitative differences of effect (Berger). Munoz distinguishes among psychopharmaceutical drugs promoting sleep, one group with euhypnic (hypnogenic) effects, and another with hypnotic (compulsive) action. He assumes that the transition from the euhypnics to the tranquilizers, and that from the hypnotics to narcotics, are fluid. While the euhypnics facilitate sleep by anxiolytic means, the hypnotics progressively—depending on the dose—influence consciousness by general, central inhibition (primarily of the *formatio reticularis*) with a relatively fixed latency period; they lead to sedation with impaired performance, confusion, sleep, narcosis. They have a clear influence on the vegetative functions (pulse, blood pressure, temperature, respiration) and frequently lead

to tolerance (also cross-tolerance), and dependence with withdrawal symptoms. The extent of a "hangover" caused by a substance (heaviness in the limbs, reduced performance) is largely dependent on the duration of action and the concentration of the substance which conditions the hypnogenic and hypnotic effect. The absence of a feeling of relaxation is accompanied by reduced body movements in sleep. In doses insufficient to induce sleep, the hypnotics are thought to bring about reversible personality changes in the sense of increasing extraversion (H. J. Eysenck). They reduce performance in many tests (Kornetsky *et al.*, 1957). However these effects on performance are difficult to demonstrate because of compensatory counter-regulation. Among the other secondary effects, the alcohol-potentiating effect and influence on driving capacity have been studied in detail.

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Hypnotism. See *Hypnosis*.

Hypobulic mechanisms. Automatic, i.e. unintentional, reflex and standardized forms of movement. They occur when the higher mental (volitional) functions are disturbed, and earlier, lower psychomotor functions come to the surface and take control (rhythmic movements, violent uncontrolled movements, hysterical stupor and attacks, catalepsy, motor negativism). W.K.

Hypochondria. It has sometimes been suggested that hypochondria in men corresponds to hysteria (q.v.) in women. Nowadays the term is used simply to denote a syndrome encountered primarily in states of anxiety (q.v.) and depression (q.v.). The subject feels pains not only in his stomach, as the etymology of the word suggests, but in his whole body. In fact the "corporality", the "animate" body, is affected in its entirety, and perception continuously manifests unpleasant sensations, so that the patient suffers greatly. The fear and depression at the root of every hypochondriac condition have endogenous rather than reactive origins. J.L.I.

Hypoesthesia. Diminished cutaneous sensitivity due to peripheral or central changes. See *Hypalgesia*. M.S.

Hypofunction(ing). The underfunctioning of organs or parts of the body. The term is generally used in connection with the endocrine glands. Depending on the organ affected, a distinction is made between pituitary dwarfism with normal intelligence, cretinism (q.v.) caused by a thyroid condition, dwarfism accompanied by feeble-mindedness, Addison's disease in the event of an adrenalin deficiency indicating underfunctioning of the adrenal medulla, and diabetes mellitus in the event of an insulin deficiency indicating underfunctioning of the pancreas, or eunuchoidism (q.v.). E.D.

Hypokinesis. Impaired movement of the skeletal muscular system, which occurs locally in paralysis but generally as a systemic disorder, e.g. in *paralytic agitans*, accompanied by a "mask face", and involuntary movements. E.D.

Hypomania. A lesser degree of *mania* (q.v.) as part of a manic depressive psychosis. It

may precede or follow mania or it may constitute an episode of the illness. Hypomanic patients may be able to function for some time in some or all of their usual social activities and in fact may be very productive. Eventually, grandiose or excessive actions or decisions lead to social complications. Like mania, it has a descriptive use and overlaps with *hyperthymia* (q.v.). *B.B.*

Hypomanic type. See *Diathetic proportion*.

Hypomnesia. Weak memory: a typical symptom of organic psychoses (q.v.) and senile degeneration of the intelligence. Initially, it affects events from the recent past rather than, e.g., memories of youth ("the new dies before the old"). *W.Sc.*

Hypophysis (syn. *Glandula pituitaria*; *Pituitary gland*). A structure with a diameter of about 1.5 cm located in the *sella turcica* at the base of the brain. As one of the most important endocrine glands it consists of the anterior lobe (adenohypophysis), central lobe (*pars intermedia*), posterior lobe (neurohypophysis) and the *infundibulum* as a connection with the brain. The adenohypophysis originates in the ectodermal vault of the pharynx; histologically it consists of typical glandular tissue and forms several hormones (q.v.) which regulate the function of the other glands. These hormones include: growth hormone (see *Acromegaly*); gonadotropic hormones (q.v.), which influence the male and female genital glands; thyrotropic and parathyrotropic hormones, which act on the thyroid and accessory thyroid glands; corticotropic hormone, which promotes the secretion of cortisone in the adrenal medulla; the lactation hormone prolactin, and the pancreotropic hormone which influences Langerhan's cells in the pancreas. The central lobe originates in the base of the third ventricle, and consists of brain tissue

(neuroglia); it forms oxytocin, which causes the uterus to contract, as well as vasopressin, which is mainly responsible for regulating the reabsorption of water in the kidney (in *tubulus contortus* II). The absence of vasopressin is responsible for diabetes insipidus; in this condition the subject may produce up to twenty liters of urine a day. *E.D.*

Hypoplasia. In general, innate or hereditary underdevelopment of an organ. It almost always leads to a reduction in, or failure of, the function of the part of the body affected. *E.D.*

Hypostasis. A process of the intellect by which an abstraction is endowed with an independent and quasi-material existence. The concept of hypostasis was developed in detail in the philosophy of Plotinus, who described the three absolute values: goodness (the infinite), intelligence, and the soul. In psychology, it is often difficult not to ascribe a material reality to the objects, terms and functions referred to (e.g. the will, ego, or superego). *M.R.*

Hypotaxia. Defective coordination of voluntary movements (see *Ataxia*). In hypnosis (q.v.), a medium state in which cataleptic rigidity and automatism are present without subsequent amnesia (q.v.). *W.Sc.*

Hypothalamus. The section of the brain belonging to the diencephalon, and situated below the thalamus, whose function consists primarily in the coordination of vegetative body functions, such as hormone functions, respiration, circulation, heat and water regulation. Close links therefore exist between the hypothalamus and the hypophysis (q.v.) and deeper parts of the brain. *E.D.*

Hypothesis. In general, a hypothesis is a statement which is assumed to be correct and is used as the basis for a discursive structure.

The word is used with the following three specific meanings: (a) a hypothesis is a means for logical classification of a situation: specific statements are used as the initial principles for a deductive theory (hypothetico-deductive theories); (b) a hypothesis is a plausible explanation preceding stringent (experimental) verification of an assumption; (c) a hypothesis is a heuristic means of discovering the truth. In formal systems, the terms hypothesis, axiom (q.v.) and postulate (q.v.) are equivalent. *M.J.B.*

Hypothesis testing. Statistical hypotheses refer to parameters of population distributions. By referring back to specific assumptions (degree of chance in selecting samples, distribution of random error), the chance distribution of sample values is determined numerically. See *Construct validity; Test theory*. *W.H.B.*

Hypothetical construct. A term for an assumption, i.e. of a phenomenon or process as existent even when not observable, or not observable as assumed. Hypothetical constructs have a heuristic value, i.e. they allow investigations to be made which would otherwise be virtually impossible. See *Construct validity; Test theory*. *R.Hä.*

Hypotonia. Excessively low blood pressure as a sign of defective regulation in the vegetatively labile, or in conditions of cardiac weakness. Hypotonia is reflected in weakness, fatigue and fainting. Ant. *Hypertonia*. *E.D.*

Hypotrophy. Contraction of organs as a result of inactivity. Occurs in the skeletal muscle, capsular ligaments and bones, when the limbs concerned are prevented from moving; also observed in the hearts of those who do not take enough exercise. Hypotrophy mainly affects all organs which are kept

motionless, but is fully reversible, unlike hypoplasia (q.v.). *E.D.*

Hysteria. A psychogenic disorder with mental and/or physical symptoms: a reaction to experiences with a strong emotional content which are not processed normally because of an innate or acquired disposition. The following—not necessarily in conjunction—are symptoms of hysteria: semi-consciousness, hallucinations, amnesia, emotional outbursts of weeping or shouting (always in the presence of other persons), pseudo-dementia, disturbances of the senses (e.g. blindness or deafness, anesthesia), paralysis, tremor, tics and motor coordination defects (inability to stand or walk, etc.). The boundary between hysteria and simulated hysteria is often fluid. Treatment is possible by environmental therapy or psychotherapy. See *Defense; Psychopathology; Neurosis; Psychoses, functional*.

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Hysterical type. A term often used to denote the opposite of the dysthymic type (q.v.): extraverted; stresses are processed rapidly, although with exaggerated emphasis, as a violent reaction. This type is described by Kretschmer: impressionable with low active retentive capacity for emotions, exaggerated reaction to stress, rapid elimination of stimuli, demonstrative façade.

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Hysteromania. 1. State of excessive activity in patients suffering from hysteria (q.v.). 2. An archaic synonym for *nymphomania*, which is an excessive desire in women for sexual intercourse. *P.Le.*

I

IA. Abb. for *Intelligence age* (q.v.).

Ich (Ger.). See *Ego*.

ICSH (*Interstitial cell stimulating hormone*). A gonadotropic hormone (q.v.) formed in the anterior pituitary (syn. LH, q.v., in women), which induces or maintains the formation of hormones in the male/female sex glands. In man: in the testicles: (a) maintenance of interstitial cells and their production of androgens (q.v.); (b) interaction with gonadotropic hormone FSH in spermatogenesis. In woman: (a) together with gonadotropic hormone FSH, induces formation of estrogens (q.v.) in the ovum, which in their turn stimulate LH secretion; (b) induces ovulation and the onset of the second phase in the female cycle; (c) conversion of the former ovum into *corpus luteum*, which produces estrogens and progesterone (q.v.) under the influence of LH and LTH (q.v.).

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H.M.

Id (Ger. *Es*). A number of psychological theories assume that the whole personality contains a separate, relatively independent area in addition to the conscious "personality". This area is thought to comprise

the unconscious "drives" ("impulses", "instincts") and emotions. In the strata theory (q.v.) of personality, the conscious area rests on this unconscious layer. It is sometimes suggested that ontogenetically and phylogenetically ordered structures are involved. By a vague analogy with the findings of brain physiology, we find references to "upper" and "lower" areas, the midbrain representing the second part of the personality and the cerebrum the first. F. Kraus spoke in this context of a "depth person", and based his conclusion on medico-physiological considerations. Nietzsche referred to this dark, mysterious area of the personality as the "id" (though, of course, he used the term "*Es*", properly translated as "it"; "id", however, has come to be the accepted English term). Using the layer theory of the personality, Rothacker took over Nietzsche's term and spoke of the "id" as the unconscious depth, or fundamental ground, of the person. Similarly, P. Lersch makes a distinction between an endothymic infrastructure and a noetic superstructure.

The concept of the "id" acquired its greatest importance in the context of Freud's depth-psychological interpretation of the personality (see *Depth psychology*). Freud referred to G. Groddeck's theories in using the notion of the "id". Freud developed his concept of the tripartite division of the personality into the *id*, *ego* (q.v.) and *superego* (q.v.) in *The Ego and the Id*, and later in *New Introductory Lectures on Psycho-Analysis*. The structural-topological aspect was added to the dynamic concepts of the "conscious"

and "unconscious". According to Rapaport, the id, ego and superego trichotomy is the most adequate structural theory of the personality in depth psychology, and therefore of importance for psychoanalytic theory. Rapaport does not, however, view it as an independent model; for him it is merely an alternative formulation of earlier theoretical concepts of Freud regarding the nature of the conscious and the unconscious.

All processes in the id are said to be unconscious. On the other hand, the ego is not claimed to be the locus of consciousness. According to the principles of psychoanalysis, the ego also contains unconscious elements. The id is the center of the passions, extends far into the somatic, and may threaten the ego in the same way as the outside world. The ego normally controls access to motility, but frequently has to implement impulses from the id. Freud describes the relationship between the ego and the id by speaking of the ego as a rider and the id as a horse: "Just as a rider, if he does not wish to leave his mount, often has no option but to give it free rein, so the ego converts the will of the id into action as though it were itself responsible for that action." (*Werke*, Vol. 13, p. 253.) Ontogenetically, the id is the older structure; the ego arises directly from the id. The superego as the "heir of the Oedipus complex" (q.v.) also derives from the id. The id contains repressed ideas (images) and inherited "drives". Freud stresses that his concept of the id has nothing in common with C. G. Jung's "collective unconscious" (q.v.). For Freud, the ego is above all the locus of the eros and the death instinct (q.v.). The boundaries between the id and ego are fluid, and the aim of psychoanalysis is to strengthen the ego and thus to make it able to resist the dangers of the surrounding world, the punitive striving of the superego, and the temptations of the id. Psychoanalytical therapy is said to remove some of the energy (libido) from the id, by means of interpretation, "working through" and resistance analysis. Freud compares this work with the

reclamation of the Zuidersee: "The ego must replace the id". (*Werke*, Vol. 15, p. 86.)

The id is one of the most often cited hypothetical constructs of psychoanalysis. It lacks precise definition, is not related to any specific behavior, and is said to be recognized only in the therapeutic process. It is, therefore, a hypothesis largely alien to the methods of modern non-psychoanalytical psychology; its theoretical value for any scientific approach is, to say the least, questionable. The use made of the "id" as a psychoanalytic concept may best be illustrated by citing Freud: "The id . . . has no means of demonstrating love or hatred to the ego. It cannot say what it wants; it has not created a uniform will. Eros and the death instinct are at odds in it; we know the means used by one instinct to combat others. We might say that it is as if the id were ruled by the silent but powerful death instincts, which are at rest and try to still the troublemaker, eros, when it seeks to obey the pleasure principle; but even then we tend to underestimate the role of eros." (*Werke*, Vol. 15, p. 289.)

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G. Lischke

Idea. 1. Even in modern times there is an immense number of diverse uses of the term (see 2, below). From the Cartesian viewpoint, an idea is an individual human mental concept; for Locke, an object of conscious thinking; for Berkeley, a sensory percept; and for Hume, an image of a sense impression. For Kant (very roughly summarized), however, an idea of reason is a concept which transcends all experience and cannot be represented sensuously. In general usage, an "idea" is usually that which is perceived mentally or intellectually, and not "by the senses". In any approximation to

scientific psychology the term requires precise contextual definition. See *Logical reasoning*; *Mental imagery*; *Thinking*. J.C.

2. "Ideas" can be concepts, attitudes, intentions, notions, images or basic models. The idea is always a product of thinking (q.v.). In philosophical usage, a distinction may be made between three principal categories: (a) As a model or regulating principle, the idea denotes the universal or all-embracing: a degree of perfection in which things participate and which is a measure of their reality or cohesion; (b) as a concept or general idea, an idea denotes an abstract class determined by its elements and also by limiting conditions; this class can only be understood in terms of its logical significance; (c) as a phenomenon of intellectual activity, an idea is a product or content of an intellectual process, and may be an innate form devoid of content, or an impression received from the environment. M.J.B.

Ideal colors. An ideal color is one obtained through a reflecting surface with a remission curve or through a color filter with a transmission curve (see *Absorption*) having values of only 1 and 0 and at most two points of discontinuity (illumination: sunlight or standard light). Example of an ideal color: a color which has the full intensity of the spectrum by mixing all wavelengths between 490 nm and 520 nm. A.H.

Idealized image (syn. *Guiding fiction*). See *As if*; *Adler, A.*

Ideal type. A complex of characteristics posited as normative and intended to be generally binding, by which individual phenomena are classified, or from which they are derived: e.g. E. Spranger's "forms of life". In a wider sense, every natural complex

arrived at through correlational statistics is an "ideal type" in that, as a conceptual construct, it serves as a yardstick for classifying individual phenomena. W.K.

Ideation. Idea formation; cognition; thinking. See *Concept*; *Inner speech*; *Mental imagery*; *Psycholinguistics*; *Thinking*.

Idée fixe (syn. *Fixed idea*). An idea, or a series of related ideas, which dominates the mental life of a person. Occurs in certain states such as obsessional neurosis. When it occurs in a more developed form in psychotic states it is known as *monomania* (q.v.) or *paranoia*. See *Schizophrenia*. R.H.

Identical direction, law of. The law of identical direction in binocular vision was formulated by E. Hering. When an object is fixated in the field of vision, the visual axes of the two eyes are aligned so that they intersect at the fixation point; they do not terminate there, but continue after intersection. If the fixation point is defined in an appropriate experimental arrangement—a red bar for the visual axis of the right eye and a blue bar for the axis of the left eye—the bars do not appear next to each other but are fused into a single image on an imaginary median line between the two eyes. The two bars are situated "in identical visual directions", and their images are therefore received at identical (retinal) points (q.v.). R.R.

Identical elements, theory of. A theory of the transfer of training which supposes that the learning of one task transfers to a second task to the extent that the new task contains elements identical with those of the original task. C.D.F.

Identical (retinal) points (syn. *Corresponding retinal points*). If the two foveae and equivalent

quadrants of the retinas of both eyes are made to coincide, an inserted needle would pass through identical retinal points; non-identical retinal points of both eyes are known as *disparate* (retinal) points. An object point whose reflected rays fall on disparate retinal points produces a double image. If the retinal points involved in the disparate image are not too far apart, the two images are fused by central coordination into a single spatial impression (see *Fusion*). This results in a three-dimensional impression (see *Depth perception*). Good spatial vision is possible in the fovea (q.v.) with a disparation of 20' (it increases from the fovea toward the periphery), but the impression of depth disappears with a 25' disparation: double images are then seen as such. Under normal circumstances this is not realized, because the eye constantly adjusts its accommodation (q.v.) and convergence (q.v.). Only objects fixated by the eye are seen clearly and consciously. In addition, not all the points of the object can be reflected at identical points, since the visual axes of the two eyes are in an angular relation to one another; no double images are formed: instead a spatial impression of the object appears.

Depth perception is only possible with disparation in the horizontal axis of the eye. Disparation in the vertical axis of the eye leads to double images rather than perception in depth.

The points whose reflective rays contact identical points on the two retinas are situated on the horopter (q.v.). All points which do not lie on the horopter result in a disparate image. If the disparate images are displaced in the temporal direction (i.e. outward) on the retina (bitemporal horizontal disparation), the impression appears "closer" than the horopter; but if the displacement is in the nasal direction (i.e. inward; binasal horizontal disparation) the impression appears "more distant". The horopter is always the point of reference.

The spatial impression is dependent on the distance of the objects, i.e. on the angle

between the visual axes of the two eyes (convergence). Depth perception therefore diminishes as range increases.

In many oblique positions, simple vision may exist—contrary to what might be expected. New identity relations may develop, so that the fovea of one eye is not identical with that of the other, but corresponds with a point situated in the vicinity of the fovea. However, simple vision is frequently simulated in a squint because the image of one eye is suppressed in perception. See *Amblyopia*.

R.R.

Identical twins (syn. *Monozygotic*, or *monovular*,* or *monochorionic twins*). Twins that develop in one chorionic sac from one split fertilized ovum (zygote). See *Twin studies*.

Identification. 1. A postulated (internal) defense (q.v.) mechanism by which a motive deprivation or motive frustration not previously experienced in its present intensity is diminished by adopting (see *Introjection*) one or more motives of other persons. The assumed motives may be substantially similar to the previous motives. Often the process centers on the person in whom the motive deprivation or frustration originated (identification with the aggressor). The direct *subjective benefit* of identification is the feeling of being at least in part the obstructive or exemplary person. The purpose of identification is to reduce the state of anxiety (q.v.) and temporary regression caused by the motive deprivation or frustration, and ultimately to forgo the opportunity for instinctual satisfaction which has been withdrawn or is threatened with punishment. The complexity of identification varies widely as a function of the frustrated motives. It ranges from thumb-sucking as a substitute for the mother's breast (identification with the mother's wish to still the child), to identification of the young girl with her mother (e.g. by playing at cooking as a substitute for direct contact with the mother), identification of the boy

with his polite and reserved father (as an answer to the failure of many of his attempts to establish contact with his mother), identification of a pupil with his schoolmaster or mistress, and identification of a great pianist's pupil, a professor's assistant, or a head of government who had an outstanding or popular predecessor with the individual model. Diagnosis of the defense mechanism of identification is therefore generally meaningless without additional information on the motives which are withdrawn or assumed. Short-term identification is also possible, e.g. with an athlete, a team, or a film star; this process may be controlled by earlier identifications but its long-term effects are frequently insignificant. In social psychology (see *Socialization*), *social learning* (as identification) is a research subject in its own right (A. Bandura, 1963). The transition from imitation to identification is not clear. Continuing imitation, in particular of forms of behavior based on longer established and more complex motives, becomes identification (Miller & Dollard, 1941). Earlier forms of identification determine later identification. The totality of identifications constitutes the superego (q.v.), which includes the more primitive environmental motives which arose as reward or punishment motives in answer to individual obedience or disobedience, and were taken over by the individual as his own motives. See *Conscience*.

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2. Ach used the term "identification" for the process in which both retinal images are combined and the new phenomenon of depth perception is produced. In auditory perception the analogous result is directional discrimination. Ach also suggested that (in

general) the fusion of two different psychic contents leads to a new content (production principle of identification).

Identification, social. A broad approximation of the action and thought of an individual to those of a model (e.g. father—son), frequently discussed in the context of imitation (q.v.); explained in terms of the greater attention given by the model individual. Bandura refers to a generalization of the cognitive aspects of imitation. See *Identification*; *Socialization*. *W.D.F.*

Ideology. 1. Any set of (e.g. political, religious or philosophical) beliefs. **2.** An ineffectual, moribund set of beliefs or program. **3.** A set of beliefs acquired (e.g. by indoctrination, q.v.) and held uncritically, to the exclusion of new (or contradictory) ideas.

Ideomotor idea (syn. *Ideomotor image*). An idea or image controlled emotionally or affectively which leads involuntarily to certain motor reactions. See *Ideomotor law*. *A.Th.*

Ideomotor law (syn. *Carpenter effect*; *Ideoreal law*). A phenomenon described by the English physiologist W. B. Carpenter in 1879: perceptual and imaginative contents, in particular those relating to perceived and/or imagined movements, may be accompanied by partial or complete involuntary drive impulses which correspond to the motor embodiment of those contents; i.e. ideas produce motor responses by innervation of muscle groups corresponding to those ideas.

H.H. & H.Ro.

Ideomotor reflex. Haab's reflex (q.v.): the two pupils contract when a bright object is fixated in a dark room. The term *ideomotor* (= idea of movement) denotes all movements

which are elicited involuntarily by emotionally colored ideas, especially in absentminded persons, who may, e.g., involuntarily imitate others. The physiological mechanism has not been explained. *K.H.P.*

Ideo-real law. See *Ideomotor law*.

Idiocy. In non-English-speaking Europe the term is still used for a serious form of mental deficiency which is either innate or acquired through brain damage in very early childhood (e.g. birth trauma, encephalitis), characterized by an almost complete condition of ineducability (no development of speech or techniques of defense against physical danger). According to the British Mental Deficiency Act (1927) idiots were defined as representing one grade of mental deficiency (see *Deficiency, mental*), i.e. those unable to guard themselves against common physical dangers. The term has not been used other than clinically since the British Mental Health Act (1959), when "idiocy" was subsumed under "severe subnormality". See *Imbecility*; *Mental defect*. *M.A.*

Idiographic. According to W. Windelband, the idiographic sciences are those which, unlike the nomothetic (q.v.) natural sciences, deal with unique events and conditions (historical sciences). The aim of idiographic personality (q.v.) research is to understand and describe as fully as possible the unique nature of an individual in the totality of his forms of expression and at the same time in the unity of his determining forces. *D.B.*

Idiosyncrasy. 1. Psychological: a reaction which deviates from the norm in the form of an intense dislike for or oversensitivity to specific persons, animals, things, dishes, odors, etc. 2. Medical: an innate or sometimes

acquired hypersensitivity to certain substances (e.g. proteins, etc.) (see *Allergy*; *Psychosomatics*). *F.C.S.*

IEM. See *Intromission-copulation-ejaculation mechanism*.

Illusion. An alteration of actuality in subjective perception: a mistaken perception of a given object. A distinction is made between illusions and hallucinations (q.v.), in which non-existent things are perceived. Illusions induced by social perception may facilitate orientation to specific requirements. Illusions occur frequently in general and specific social spheres. Psychotherapy (q.v.) may center on different combinations of illusions. See *Fantasy*; *Mental imagery*; *Schizophrenia*. *U.H.S.*

Illusions, acoustic, optical. In the case of sense perception, an illusion is a subjective distortion of the objective content of the sense data. The many optical and acoustic illusions are experienced by most people and are not a special feature of abnormal states. Piaget has divided illusions into two classes: those in which the subjective distortion increases with age and those in which it decreases. Examples of illusions: *Müller-Lyer illusion*, *Hering's illusion* (q.v.). See *Geometrical-optical illusions*. *C.D.F.*

Image. 1. A mental representation: i.e. one of the senses of "idea" (q.v.). **2.** Any representation, copy, likeness, imitation or similitude. **3.** A mental copy of a sensory quality or experience in the absence of any sensory stimulus. **4.** An attitude (q.v.) toward, e.g., a national type. See *Stereotype*; *Mental imagery*.

Image types (syn. *Ideational types*; *Idea types*). In Charcot's typology these are individuals

whose mental imagery (q.v.) (or ideation) is oriented to a specific sensory modality. See *Fantasy*.

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Imagination is the ability to call to mind, or "picture forth", situations, processes, objects and individuals which are not present. It includes, according to Jung, images of elementary situations, processes, objects or persons which appear as "collective human experience", supposedly without specific human experience. "Creative imagination" is the artistic or scientific combination of such elements into novel unities: e.g. as works of art, philosophic systems, or scientific hypotheses and planned experimentation. See *Fantasy*; *Archetypes*; *Imago*; *Literature*, *psychology of*. W.T.

Imago ("image"). A wax portrait mask placed on a corpse displayed in the forum in ancient Rome. Freud used the term "imago" to denote the idealizing or de-idealizing distortion of personality which may occur in the course of transference (q.v.): the analyst, for example, may become a father-image. Jung used the term to denote the subsequently effective "image" of a reference person. A psychoanalytical journal took the name *Imago* (later *American Imago*) from C. Spitteler's novel of that title; it deals with literary, mythological and historical subjects from a psychoanalytical standpoint. W.Sc.

Imbecility. The British Mental Deficiency Act (1927) defined imbeciles as "persons in whose case there exists mental defectiveness which, although not amounting to idiocy, is yet so pronounced that they are incapable of managing themselves or their affairs or, in the case of children, of being taught to do so". The term is no longer in use and since the introduction of the British Mental

Health Act (1959) has been replaced by the terms "subnormality" and "severe subnormality". V.K.J.

Imipramine (*Tofranil*; G22355). A dibenzazepine derivative: one of the group of tricyclic antidepressants. Imipramine was used as the first tricyclic antidepressant and is generally used as a comparison substance for the effectiveness of other antidepressants. In healthy persons there are subjective symptoms of sedation with therapeutic and relatively small individual doses of imipramine. Performance changes in the form of reduced visual motor ability appear when higher therapeutic doses are administered. According to Di Mascio *et al.* (1964; 1968) the mood of healthy, depressed persons is improved, but a contrary effect is evident in some depressed patients.

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Imitation. 1. Experiments in animals, children and adults have shown that the observed behavior of a model may provoke more or less similar behavior in the observing subject (O), even when the latter did not show similar behavior patterns before (learning by imitation). The extent and nature of the imitation are dependent on features of the model, the traits and experience of the observer, and the observed reward or punishment for the model behavior ("representative reinforcement"). The acquisition of, e.g., aggressive behavior as well as standards and value

scales is substantially influenced by imitation. See *Socialization; Aggression; Identification*.

2. Behavior is said to be imitative if (a) there is a similarity between the behavior of the model and of the imitator; and (b) the behavior of the model and not other stimuli is the determining factor in the behavior of the imitator. The instinct (q.v.) theory of imitation has been replaced since about 1920 by various conclusions of learning theory. Allport (1924), Piaget (1951), O. H. Mowrer (1960) emphasized the importance of associative and classical conditioning mechanisms, while N. E. Miller & J. Dollard (1941) as well as B. F. Skinner (1953) stressed instrumental mechanisms. For imitative learning, the contiguity of sensory events is essential (according to Bandura, 1968), and for imitative behavior the nature of the reinforcement. See *Conditioning, classical and operant; Imprinting; Learning*.

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Immediate memory (syn. *Short-term memory*). Momentary storage (duration not exceeding 30 sec. approximately) of information items and their reproduction, as compared with long-term storage (retentive or real memory). This is a genuine function of memory (q.v.). Immediate memory is very liable to disturbance; the matter is very frequently forgotten; the amount depends on the material and the particular sensory modality, and can be extended by verbal coding (Dornič, 1970). In consequence of the unusual conditions operating when the information items were acquired (e.g. a single presentation),

immediate memory is treated in some research projects as a unique phenomenon, but is thought to be governed by the same processes as long-term memory (Postman, 1964). Clinical (retrograde amnesia, q.v.), neurophysiological (electric shock), cybernetic, and factor-analytical observations nevertheless suggest that an independent process (and system) is at work. Broadbent (1958) is of the opinion that the immediate memory acts as a selective filter and distributes information.

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Immorality. 1. Dishonesty. 2. Contrariety to that which a particular moral, religious, legal, political, or social system conceives as virtuous or binding behavior.

Imperceptible given. All those things which at the moment cannot be perceived by some persons and yet are experienced as being really present. For example, all the parts of a perceived object and not merely its visible aspect are experienced as being directly present. Completion phenomena, which have been closely studied by gestalt psychologists, represent an important aspect of the imperceptible given, which must be distinguished from what is only represented in the mind. F.Ma.

Implosive therapy. A form of "learning therapy" developed by Stampfl (1968). Taking as his starting-points the two-factor theory (q.v.) of learning (q.v.) and the concept of secondary motivation (q.v.), Stampfl assumes that neurotic symptoms represent avoidance responses which are produced and maintained by a complex pattern of conditioned aversive stimuli. (See *Neurosis*.)

In contrast to other forms of therapy based

on learning theory (see *Behavior therapy*), implosive therapy makes use of suggestions from depth psychology (q.v.). Implosive theory does not set out to inhibit neurotic symptoms directly but endeavors to remove the symptoms by extinguishing the conditioned aversive stimuli which motivate the neurotic behavior. In order to do this, the maximum number of stimuli of the original conditioning, with the exception of the unconditioned aversive stimulus, are reproduced verbally or in some other form. On the principle of extinction generalization (see *Extinction; Generalization*), this diminishes the "aversiveness" if the conditioned stimuli are removed from those avoidance responses which constitute the neurotic behavior. Special attention is given to "concealed" stimuli, i.e. stimuli of which the patient cannot give an account (see *Unconscious*). Hence implosive therapy takes into account determinants of neurotic behavior neglected by other learning therapies. See *Aversion therapy*.

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F.Ma.

Impotence. 1. Inability of the male to achieve or maintain sufficient penile erection to complete sexual intercourse. Often regarded as resulting from psychological factors, e.g. sex guilt, unfortunate early experiences, feelings of inadequacy, and so on. 2. Inability of the male to produce offspring (*sterility*). 3. A feeling of helplessness (inability to control events).
G.D.W.

Impression. An overall picture of some object, say a landscape or a person, as the product of a relatively complete process of cognition or perception. In the psychology of expression (q.v.), an impression is constitutive in so far as there is no expression as such, but only an expression for someone who apprehends it as a (valid) impression. There are three main approaches:

1. *Phenography*. Study of the sensory channels by which the impression of someone's personal "thusness" is transmitted. The emphasis is on visual (see *Physiognomy; Pathognomy*) and auditory (phonognomy) access; less regard is paid to the tactile (manual pressure) or olfactory aspects of impression.

2. *Analysis of function and interpretation*. This approach deals with the question of how expressive phenomena are apperceived and interpreted. Social perception (q.v.) research is important in this regard (Graumann, 1955/56; Tajfel, 1969; Tagiuri, 1969). There are four main (in part socially conditioned) perceptive factors which go to form an impression: (a) *selectivity*, which, in addition to attitude (q.v.) and attention (q.v.), includes the concepts of sensitization and perceptual defense (q.v.); (b) the *organizing act of perception*, underlying which are the gestalt tendencies of perceptual cognition; (c) *accentuation*, which modifies the impression by emphasizing a certain point of view; and (d) *fixation*, concentrating on points in the stimulus field selected by reason of attitude, prejudice, anxiety, etc. Research into these perceptive factors coincides in large measure with the actual-genetic aspect. From the ontogenetic angle, maturation and learning processes form part of the socio-cultural background (attitudes, stereotypes).

3. *Conditional analysis and interpretation*. This approach examines impressionability and the means by which human or animal expressions become impressions for the recipient. (a) The theory of association (q.v.) assumes that, when certain expressions are presented to the recipient, similar ideas (images) and emotions are (associatively) set in train; (b) the analogy (q.v.) theory maintains that the observer of an extraneous expression draws conclusions about it on the basis of his own behavior; (c) the theory of empathy (q.v.) (T. Lipps) assumes that an impression of another psyche comes about by means of "mimpathic" and "copathic" experience of others' expressions; (d) the

theory of rudiments—a version of “empathy”—is based on the assumption that sympathetic micro-movements (ideomotor law, q.v.) during the perception of an extraneous expression produce the elements of a corresponding inner state. Each of these theories is seriously inadequate. The problem of “impressionability” (understanding expression) is still unresolved. Interesting approaches to the phylogenetic aspect are to be found in ethology, which connects the “innate releasing mechanism” (q.v.) with the phylogenetic development of impressionability (Leyhausen, 1967). See *Emotion; Instinct*.

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Imprinting. Many animals attach themselves only to members of their own species. But some prefer creatures of a different species which they encountered first; they follow them about, pair with them when fully grown, and try to copulate with them: “imprinting” has taken place.

1. *Definition.* (a) According to Lorenz (1935), imprinting is learning (q.v.) restricted to certain periods in life (sensitive or critical phases); (b) only the releaser, or key stimulus (q.v.), of a certain reaction (i.e. characteristics of an object in a specific functional area) is imprinted by differentiation of releasing mechanisms with—initially—low selectivity; (c) imprinting is *irreversible*; (d) not individual but species characteristics are learned; (e) imprinting can take place even before readiness for the corresponding responses has matured; (f) *readiness to learn is extinguished* when something definite has been learned, or because of internal processes

of change at the termination of the critical period—even when there has been no learning.

Hess (1959) agrees with Lorenz in emphasizing that imprinting differs from associative learning: in imprinting, the animal achieves more success if practice is restricted to a short period of time; in addition, in choice situations what was learned *first* prevails over what was learned *later*. With learning by association exactly the opposite holds good. Moreover, in the latter case aversive stimuli bring about a rejection of the associated stimulus, whereas they reinforce imprinting. A further difference is the effect of the tranquilizer meprobamate on learning achievement: in hens the solution of color-discrimination tasks is not impaired, whereas imprintability drops almost to zero.

Since the concept of imprinting is based on an “injunctive definition” in Hassenstein’s (1954) sense (i.e. “. . . to define the concept of life it is necessary to enumerate a number of constituent characteristics, none of which, taken by itself, constitutes life, but which taken all together, in their summation and interaction, do indeed represent the essence of life”). Lorenz, 1966), continuous transitions to related and similar phenomena may be expected. Hence Eibl-Eibesfeld (1967) points to the fact that the criteria (a) and (d) are also valid for other learning processes. Since the requisite basis has still not been found for statement (e), what remains as the distinguishing feature of imprinting is only “primacy of experience” (c) = irreversibility (Hess, 1959; Lannoy, 1967). However, according to Smith (1969), it cannot be generalized: the presence of an imprintable phase must be considered the crucial difference from associative learning. That such a phase does in fact exist is denied by Hinde (1955, 1962), Thorpe (1963) and Bateson (1963). Lannoy (1967) suggests a new approach: he would prefer a distinction to be made between imprinting and learning on the basis of the “facility in learning certain interactions dependent on the transmutation time”, in

which operation a "certain transmutation time-limit prevents animals from reaching all response levels".

2. *Incidence.* The dominance of early experience with members of a different species over later experience with members of the same species has so far been established in fish, birds and mammals (in particular). Among fish, certain mouth-breeders (*hemichromis bimaculatus*) prefer alien young to their own if, when they breed for the first time, eggs of an alien species are given them as substitutes (Myrberg, 1964). The fact that mammals reared by humans become attached to them instead of to members of their own species has been observed, e.g., by Grzimek (1949), F. Darling (1938), Hediger (1955), P. Leyhausen (1967) and L. Wilson (1966). According to Gray (1958), Thorpe (1961) and Hampson (1961) man, too, is probably imprintable. There is as yet no experimental proof; the psychoanalytical theory of childhood dreams and various ethnological observations (M. Mead) support this view, but both have only limited validity.

3. *Experimental investigations.* There are numerous accounts of experiments carried out into object imprinting (following responses and behavior toward sexual partners) and motor imprinting (learning the song of parents of an alien species) in birds.

(a) *Part areas and methodology.* The following were studied: beginning and end of learning ability, learning time required, influence of learning conditions on learning performance, nature of the learned phenomenon, effect of the learning processes and the matter learnt on the form of actions and their relation to objects, and the degree to which the success of later learning processes depends on earlier learning. The findings are based on comparisons of the responses of test animals when either members of the same or different species or certain objects are presented to them at time intervals or simultaneously.

(b) *Results.* In following experiments with a one-hour learning period, ducks are most

susceptible to imprinting thirteen to sixteen hours after birth (critical period). Until they are five hours old, chicks react unspecifically; after twenty-four hours they react less and less well, until finally flight occurs (end of the sensitive period) (Fabricius, 1964; Hess, 1959). Changes in the duration of contact can have an effect on the extent to which following and sexual behavior can be released: after remaining for at least forty-eight hours with the imprinting object, two-day-old chickens prefer this in copulation experiments; shorter contact periods produce only following responses (Andrew, 1966). Apart from the *duration of contact*, successful imprinting depends, too, on the *frequency of contact*: a contact of twenty minutes repeated on five successive days produces better following imprinting with a turkey than if five contacts are arranged in the course of a single day (Hale, 1969).

Apart from time factors, successful imprinting depends on properties of the object characteristics; it can be enhanced by movement and the combination of qualitatively different stimuli and the simultaneous presentation of the imprinting characteristic and the gratification of a need. (Immelmann, 1967; Klopfer, 1968; Smith & Nott, 1970; Gottlieb, 1965; Boyd & Fabricius, 1965).

Responses to combinations of characteristics in choice experiments show that imprinting is possible on certain colors, patterns, body shapes and movements, sounds, kinds of odor and combinations of all these (Smith & Bird, 1963; Goodwin & Hess, 1969; and others). But, according to Klopfer (1968), the results of experiments can turn out differently when the same pairs of characteristics are presented; this may depend on the nature of the reward, the arrangement selected for the experiment, and the animal's innate preference for certain stimulus qualities as its internal condition varies. The strengthening or weakening of imprinting by subsequent experiences can also influence results (Schutz, 1965; Sluckin, 1964).

Imprinting always affects only the *orientation*

and never the form of the action: imprinted animals mate with members of different species but use movements peculiar to their own species (Schutz, 1965; Lannoy, 1967; von Frisch, 1957).

Subsequent learning processes can follow independently of any previous ones and produce imprinting on different objects in different functional areas (Lorenz, 1935; Schutz, 1965).

Similar conditions apply to song imprinting as to object imprinting (Thorpe, 1958; Nicolai, 1959; Immelmann, 1965).

No characteristics which might exclusively distinguish imprinting have so far been obtained from investigations based on behavioral comparisons, but there are two which stand out: the imprinting phase and the preference of what was learned first to what was learned subsequently (Lannoy, 1967; Eibl-Eibesfeld, 1967). The exact nature of the processes leading to these features is still an open question; if they were known it could perhaps be shown whether imprinting differs fundamentally from other forms of learning (Smith, 1969). See *Instinct; Animal psychology; Comparative psychology; Conditioning, classical and operant*.

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B. Tschanz

Imprinting and lactation. The concept of “imprinting” (q.v.) was first used in animal

psychology. As applied to human beings it was used to express the long-lasting, "imprinted" effect of impressions received in the early months of life. In this connection the following was observed: if a baby is given a wet-nurse for the first weeks and months after birth, when the infant is weaned subsequently, it remains for a time more attached to the nurse than to its mother. It can be seen from this that the breast-feeding period has an emphatic "imprinting" effect from foster-mother to child.

M.S.

Impulse. See *Impulsiveness; Drive; Instinct; Motivation*.

Impulsiveness (syn. *Impulsivity*). A temperamental factor classifiable as extraversion. Impulsiveness is characterized by spontaneous direct action with little regard for the consequences. There is a slight correlation between impulsivity and the intelligence factors of fluency of thought and expression.

G.K.

Impulsive neuroses are mental disorders in which the person affected follows irresistible impulses, e.g. to start fires, wander, steal or commit certain crimes. The impulsive neurotic is often similar to the "psychopathic personality" in his behavior. See *Psychopathology*.

W.T.

Inadequate stimuli are significant changes in the environment which do not occur under normal conditions; these changes affect excitable biological substrates and evoke reactions in them (excitation). Electrical or mechanical stimuli are inadequate for the eye whereas thermic stimuli are inadequate for the vestibular apparatus (ear); nevertheless they react with a corresponding sense impression or response if the inadequate stimulus is sufficiently strong. The threshold (minimum successful stimulus strength) is substantially higher with inadequate than with adequate stimuli.

E.D.

Inanition. This term denotes the psychological aftereffects of the withdrawal of affective attention in early childhood. After a stay in hospital or in a children's home where the child has to do without affectionate interest, there may be a significant retardation of psychomotor development, or some regression to earlier behavior patterns, accompanied by a physical susceptibility to illness. See *Hospitalism*.

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M.Sa.

Inbreeding. The mating of closely related animals, usually resulting in the magnification of certain traits. These traits may be regarded as favorable (e.g. intelligence) or unfavorable (e.g. deafness), but deleterious effects are apparently more likely because of the increased manifestation of recessive and mutated traits. Also, for some unknown reason, inbreeding tends to reduce the fertility of the offspring. The *coefficient of inbreeding* for an individual is calculated as the likelihood that he will possess identical genes at any pair of loci as a result of inheritance from both mother and father.

In sociology, *inbreeding* refers to the process by which a group or institution may tend toward stagnation or even extinction through failure to enlist new elements.

G.D.W.

Incentive. 1. Something which incites to action (particularly higher productivity). 2. An incidental reward. 3. A motive (q.v.).

Incest. Sexual relations (coitus) between related individuals. Infringement of one of the oldest sexual taboos, which stems from magical and religious sources; considered as a serious sexual offence in most societies. The extent of the prohibition and the penalty threatened vary widely. There is no legal penalty in some countries (e.g. Luxembourg, Belgium,

Portugal, Turkey). The commonest forms are father-daughter and stepfather-stepdaughter incest. The proportion of concealed cases is thought to be high. Cases disclosed: primarily from the lower social strata (80%–90%); in the middle and higher social groups the “zone of secrecy” is greater. Recidivism: less than 5%. Male offenders are on average forty to forty-one years old on committing their first offense; they are primarily of average or above average intelligence (60%–85%); half of them are socially and psychopathologically unobtrusive; they are rarely psychotic (3%–6%), and in very few cases “hypersexual”. The main features of offenders with striking social and psychopathological characteristics are lack of control over aggressive, oral (alcohol), and/or sexual impulses (in all about 40%), and/or maladjusted careers or lives (approximately 35%). The female “victims” are generally at the age of puberty when the offenses begin (around thirteen years old); they are of average or above-average intelligence (approximately 80%), and frequently show disturbed personality symptoms (about 70%)—but these characteristics are no more frequent after incest than before. Incestuous relationships are conditioned by many different factors. The main predisposing factor is a disturbed psychosocial relationship in the family. Incest is not a cause but a consequence of disorganized family life (approx. 80–90%).

The origin of the taboo has as yet resisted all historico-anthropological and psychological attempts at elucidation (degeneration theory, theory of instinctive incest-defense, theory of acquired disinclination, politico-economic cooperation theory, the phylogenetic theory of the incest taboo. See Maisch, 1968, for survey and summary). One sociological theory holds that in modern industrial society the incest taboo has lost any vital social significance, but nevertheless views it as an integrative element of the bourgeois family structure which may well fulfill important psychological and social

functions in the development of the individual personality (Parsons’ structural-functional theory).

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Inclination. 1. A leaning or sloping. An angle measured from the vertical. **2.** A motivational tendency (non-technical usage).

G.D.W.

Incontinence. Inability to retain stool or urine. Can be caused by, e.g., paraplegia (lesion of the spinal cord) after an accident; damage to the lumbar region of the spinal cord, caused by a slipped disc or carcinomal metastasis. Apart from such physiologically explicable cases, modern approaches to most forms of enuresis (q.v.) or encopresis (q.v.) treat them as faulty conditioning, variously amenable to behavior therapy (q.v.).

E.D.

Incubation. In the study of anxiety (q.v.) and fear (q.v.), the term “incubation” has been used to describe two related phenomena. The first usage refers to “a growth of fear over a time interval which follows some aversive stimulus. The increase in fear is assumed to be spontaneous in the sense that the time interval is free of further exposure to the aversive stimulus” (McAllister & McAllister, 1967, p. 180). In a review of studies dealing with this concept of incubation of anxiety, McAllister & McAllister (1967, p. 189) conclude that “the phenomenon has yet to be convincingly demonstrated”. Eysenck (1968) suggests that incubation in this sense does not deserve a special title, and can be explained in terms of a reminiscence-type theory based on consolidation of memory traces.

More recently, the term incubation has been used to refer to an increment in conditioned response (CR) over a number of trials

when the conditioned stimulus (CS) is applied but without reinforcement (UCS). This second concept Eysenck (1968) prefers to call the "Napalkov phenomenon" in honor of the Russian investigator who first drew attention to it. Evidence for the Napalkov phenomenon from both animals and human Ss. is reviewed by Eysenck (1968). In these studies the CRs increase in strength over trials where the original aversive UCS was withheld. The effects are clearly in evidence and are difficult to fit into any existing learning paradigm. In the usual conditioning paradigm the CR gradually extinguishes when the CS is presented in the absence of the UCS. In the studies under discussion, the CR increased. Thus, in the first series of experiments, the CR increased over *time* without further conditioning trials; in the second series the CR increased over *unreinforced trials*.

Eysenck (1968) proposes a theory to explain the second phenomenon, laying stress on the CR being, in itself, an aversive stimulus in a feedback cycle which interferes with the usual extinction processes. He argues that an unreinforced CS will always provoke a decrement in the CR, but will also provoke an increment. The observed CR will be the resultant of these two opposing tendencies. Extinction will occur when the decrement exceeds the increment, incubation when the opposite occurs. The increment in strength of the CR is explained in the following way: in aversive conditioning, a CS is followed by a UCS which produces a variety of unconditioned responses (UCRs). After a number of pairings of CS and UCS, the CS either alone or accompanied by the UCS will produce a variety of CRs, and some of these CRs will be physiological in nature (arousal, q.v., which is termed anxiety or fear). The CS has thus acquired the function of signaling danger and impending pain. The emotional responses of fear or anxiety thus elicited are themselves aversive stimuli which, by classical conditioning, come to be associated not only with the reinforced CS but

also with the unreinforced CS. By a feedback system, even unreinforced CSs are actually reinforced and tend to evoke more fear on the subsequent trials. The stimulus value of the emotional responses is in most cases small, and the resultant of the increments and decrements of unreinforced CSs will usually produce extinction. But under certain conditions, possibly when the UCS is exceptionally strong, the resultant effect will be incubation of the conditioned emotional response. A number of parametric studies are required to ascertain the conditions under which incubation instead of extinction occurs, and some hypotheses are proposed by Eysenck (1968) and Ramsay (1969).

Incubation of anxiety as seen in the laboratory has important implications for the study of neurotic behavior. The view of the development of neurosis in learning terms has long been considered inadequate to cover what the clinician observes in his patients. In humans, the processes of verbal conditioning, covert sensitization, imaginal behavior rehearsal, and cognitive factors probably play an important role in the incubation of anxiety, and the behaviorally-oriented theoretician and clinician have yet to integrate these concepts in their approaches. It is possible that a fuller investigation of the processes involved in incubation will bring theory and clinical practice more into line in the understanding and treatment of neurosis (q.v.).

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R. W. Ramsay

Incubation processes. 1. Processes during a phase of apparent rest in which a covert development takes place after which there is a distinct alteration in the general condition. **2. Medical:** processes during the time between infection and the outbreak of an

illness. 3. Psychology of thought: several "phasic" models of productive thinking use the categories (a) preparation, (b) incubation, (c) illumination, and (d) verification. *H.W.*

Incubus. A nightmare. In medieval demonology, an evil spirit which was supposed to lie upon and oppress sleeping persons, especially a male spirit which copulated with sleeping women. Cf. *Succubus*: a female spirit which seduced men during sleep, thus causing nocturnal emissions. *G.D.W.*

Independent variable. See *Variable*.

Index. Indices are ratios characteristic of a body-build and summarized in a mathematical formula; they facilitate the determination of a type (e.g. body-build indices according to H. J. Eysenck, E. Kretschmer, G. Kühnel, W. Plattner, I. Pignet, E. Strömngren, K. Westphal). See *Body-build index*. *W.K.*

Indicators, motivational. A term used to denote variables of stimuli which arouse motivation (q.v.) to a specific behavior, and those which follow some motivation, i.e. variables of motivated responses, motivated behavior. *R.Hä.*

Indifference point; indifference zone. The point of transition between opposites in experience, the neutral point in any series having positive and negative values. This point has been called the *Adaptation level* (q.v.) (Helson), since it varies with its context. A slightly more specific definition applies in the context of psychophysics (q.v.) experiments, in which the indifference point is that stimulus in a graded series which is reproduced or recognized correctly, whereas smaller ones are overestimated and larger ones underestimated. *C.D.F.*

Individual. 1. A single unit, theme, case, etc. 2. A single, distinct organism. 3. A person (q.v.), especially as conceived by psychoanalysis (q.v.) or individual psychology (q.v.). Adler drew specific attention to the difficulty of harmoniously integrating the individual into society (socialization, q.v.). He suggested that the child had to overcome a natural feeling of inferiority, and the way in which he managed this was dependent on the environment (parents). He considered this to be the starting point for education. See *Adler, Alfred*. *M.S.*

Individualism is the tendency to attribute independent reality to a single individual (implying nominalism) and to conceive of him as the sole basis of all values and the sole source of social achievements. The individual is both the highest value and the ultimate objective: groups, institutions and the state are simply means to allow the individual to develop. The attitude of the individualist leads to a pattern of behavior which is independent of collective standards. *M.R.*

Individuality. The unique nature of the personality (q.v.). Representatives of idiographic (q.v.) personality research (such as G. W. Allport) understand individuality as the unique *qualitative* characteristic of the individual, whereas representatives of the nomothetic variety (such as J. P. Guilford) consider it as the unique *quantitative* characteristic (in the sense of a uniqueness of the individual configuration of factor values in the relevant ability and personality factors). Apart from twin studies, no reliable empirical research data is available on the subject of individuality. But see *Abilities; Traits; Type*. *K.P.*

Individual psychology. 1. See *Differential psychology*.

2. The psychological theory of Alfred Adler

(q.v.): "The fundamental fact in human development is the dynamic and purposive striving of the psyche. . . . The unity of personality is implicit in each human being's existence. Every individual represents both a unity of personality and the individual fashioning of that unity." An approach based on the existence of an inferiority complex (q.v.), especially in neurotic individuals, and on a reaction to this complex in the form of compensation. In addition to its influence on the methods of certain psychotherapists who follow Adler's theory, "individual psychology" has had a considerable influence in some educational circles.

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Individuation. Jung uses the term "individuation" to characterize the process of reaching maturity and developing the individual personality. The collective unconscious (q.v.) which is composed of archetypes (q.v.), is said gradually to change through individuation into the self (see *Ego*). In immature personalities the process of individuation is delayed. Some Jungian psychotherapeutic methods attempt to foster individuation by analyzing the symbols which appear in dreams and visions. *J.L.I.*

Indoctrination. Instruction in ideas or beliefs which requires their complete acceptance.

Induction. An intellectual procedure which consists of working through a finite number of given propositions in order to arrive at one proposition (the conclusion) which implies them all. In most cases the given assertions are inferred from observed facts. The induction then leads to a law which summarizes them. If the law is able to account for more than the observed facts, we speak of *ampliative induction* (or inference), and in other cases of *perfect induction*; in this case we have a deduction based on the laws

of logic: what is true for each individual entity of a class is true for all other instances. On the problematical nature of the assumption of a measure of uniformity in nature (an assumption made in all inductive reasoning), see Ayer, 1956.

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Induction coil. An apparatus based on the principle of electro-magnetic induction which can be used to provide a variable but controlled amount of electric current as an aversive stimulus, usually for experiments on learning or conditioning. *G.D.W.*

Inductor. See *Token object*.

Industrial engineer. An engineer who has to solve industrial problems (systems, working times, personnel management, etc.) by analytical methods. See *Time and motion study*. *G.R.W.M.*

Industrial engineering. The work of industrial engineers in planning, implementing and supervising measures to increase productivity. This work is based not only on technical and business experience but primarily on ergonomic principles. *G.R.W.M.*

Industrial psychology. That branch of applied psychology (q.v.) which is concerned with work and economics. Its aim has often been stated as maximizing *efficiency* in the production and distribution of goods and services through the study and manipulation of "*human factors*"—the approach of *ergonomics* (q.v.)—but there is an increasing tendency for the satisfaction of workers and consumers to be regarded as an end in itself (Smith & Cranny, 1968). Though the industrial psychologist may orientate his work from the viewpoint of the individual worker, management, the

organization, or the consumer, it is widely recognized that efficiency is usually best served if the interests of all parties are taken into account. There follows a brief outline of some of the problems and areas with which industrial psychologists may be concerned.

1. *Vocational guidance.* Since the choice of an occupation is one of the most critical decisions any person has to face in the course of a lifetime, he may seek the advice of a psychologist. The aims of vocational guidance are to bring the individual to a realistic awareness of his own potential, and to point out those of the various possibilities open to him which are compatible with both his talents and interests. To supplement his skill as an interviewer, the vocational counselor will probably use *objective tests* (q.v.) of general *intelligence* (e.g. Wechsler Adult Intelligence Scale, Raven Matrices), specific *aptitudes* (e.g. Differential Aptitude Test, q.v., Battery, General Aptitude Test Battery, q.v.), and *occupational interests* (e.g. Strong Vocational Interest Blank, q.v., Kuder Preference Record, q.v.). For a detailed description of these tests, see Cronbach (1960). The final decision is, of course, left with the client, and he may be so keenly motivated to attempt a particular career that he will accept as little as an estimated 10% chance of success.

2. *Employee selection and placement.* If there is a surplus of applicants for a particular job, the industrial or *personnel psychologist* may be called upon to develop a *selection program*, so that the best possible use can be made of the available talent. In this case he must take the view of the management or organization rather than that of the individual applicant. Since it is essential for the psychologist to know exactly what is entailed in the job concerned, and the skills and attributes which are relevant to effective performance, it may be necessary to start with a detailed *job analysis*. Then, in addition to the well-known tests of general intelligence and aptitudes referred to above, new tests specific to the particular situation may have to be

developed and standardized for purposes of selection.

Once an applicant has been accepted by an organization, it may still have to be decided exactly what job he will do, in which department, and so on. This task of *placement* within an organization has elements of both vocational guidance and selection, remembering that work satisfaction is directly related to *productivity* and inversely related to staff *turnover*.

3. *Training.* Psychologists may also assist with the training of new employees, the retraining of old employees for new jobs, or the training of instructors in methods of instruction. Here, all the general *laws of learning* are applicable, e.g. the importance of motivation, knowledge of results, distribution of practice, etc. With *automation* has come a particular need to study methods of retraining and the variables which affect acceptance of, and resistance to change.

An effective training program presupposes a knowledge of the best and most efficient methods of work. *Time and motion study* (q.v.), associated with the names of F. W. Taylor and F. Gilbreth who introduced it into the USA in 1911, involves observing the worker at his job and carefully analyzing all his movements and the time taken to execute them with a view to reducing them and thus increasing efficiency. Although this means that with payment on the basis of productivity the worker can increase his earnings, naïve attempts to apply the method in the past have resulted in a great deal of resentment from workers who fear invasion of privacy, exploitation by management, redundancies, and loss of the freedom to do things their own way. This provides a good example of the complex psycho-social problems involving workers' attitudes, which are encountered by the industrial psychologist in his attempts to increase efficiency.

4. *Motivation, morale, and conditions of work.* Motivation is, of course, most directly manipulated by wage incentives such as piece rates and productivity bonuses, but

there is an increasing tendency for psychologists to regard the maintenance of morale (i.e. favorable attitudes) in the work situation as equally important. Morale may be facilitated in a variety of ways, e.g. by providing an avenue of communication between workers and management so that complaints can be registered, ensuring that work groups are compatible and that adequate social and recreational facilities are available. Improving the environmental conditions, e.g. by increasing illumination, reducing ambient noise, installing air conditioning, careful planning of color and decorations, provision of music, and so on, may increase productivity, depending on the personality and other characteristics of the workers concerned and the kind of work that they are doing. While this may sometimes result from direct improvement in physiological functioning, the effect more often results from the positive attitude engendered by pleasant surroundings (Maier, 1955). In the famous "Hawthorne studies" with female relay assembly workers at the Western Electric Company in the USA, it was found that the mere fact of studying workers' conditions was sufficient to exert a beneficial effect upon morale, and thus output, irrespective of the particular changes in physical conditions that were made (Roethlisberger & Dixon, 1940). (See *Hawthorne experiments*.)

5. *Fatigue*. One of the most important factors which interferes with work efficiency is *fatigue* (q.v.), which may be defined as that decrement in work performance occurring as a function of effort and time spent on the job which is recoverable through rest. The effects of fatigue upon psychomotor performance were studied in a well-known experiment conducted at Cambridge University using a simulated aeroplane cockpit. Subjects were required to sit in the "Cambridge Cockpit" for many hours at a time, making prescribed responses to signals which were complicated in their sequence, color, location, etc. The manifestations of fatigue were various, beginning with a

widening indifference to signals which required action, slow reactions, and lapses in judgment, and culminating in complaints of tiredness, bodily discomfort, and emotional outbursts. Among the factors which have been found to forestall or alleviate fatigue are motivation, knowledge of results, rest pauses, and certain drugs such as caffeine (q.v.) and benzedrine (Munn, 1958).

6. *Equipment design*. However high the individual's level of aptitude, training, motivation, morale, and so on may be, his efficiency is also a function of the machines with which he works. Whereas training is concerned with adapting the man to suit the machine, the industrial psychologist may also help in designing the machine to suit the operator. This is one of the central concerns of the field sometimes called *engineering psychology*. For example, finding the best possible spatial arrangement for the controls and instruments in a motor car, aeroplane cockpit, or space craft, designing legible and unambiguous traffic signs, and so on, requires a knowledge of the perceptual and motor capabilities of human beings. Left to their own devices, engineers too often design equipment for appearance or mechanical convenience, without regard to the limitations of the persons who have to work with it.

7. *Organizational processes*. Another area which may be considered part of industrial psychology, although it overlaps the domain of *industrial sociology*, is the study of efficiency in industrial organizations (e.g. Katz & Kahn, 1966). It is now well established that large organizations have functional requirements for growth and survival which create problems of efficiency of their own, independently of the individuals and equipment which comprise the organization, e.g. problems of communication, leadership and authority. Different kinds of organizational structure have been identified (e.g. "tall" versus "flat", "rational" versus "irrational") and these have been related to the characteristic attitudes and behavior to be found within them (Smith & Cranny, 1968).

8. *Consumer research and advertising.* Finally, there is the branch of industrial psychology in which interest is focussed on the product or service itself, and its acceptability to the consumer (sometimes called "business psychology"). Consumer research is concerned with discovering the needs and motives of the public with a view to providing products and services which are appropriate to them, whereas marketing and advertising are concerned with the distribution of established commodities, e.g. by promoting public awareness of them and persuading potential consumers of their desirability. As with many other areas of applied psychology (and applied science generally) this field presents some ethical problems concerning which little agreement has been reached, e.g. the use of deliberate deception in research and advertising.

Some of the tasks frequently undertaken by consumer psychologists include: assessing the acceptability of a proposed new product, its brand name, package design, etc.; discovering the primary factors which determine brand preferences and purchasing decisions within a particular product field; assessing the public image of an established company, politician, entertainer, etc.; investigating the most effective media of communication for promoting a particular commodity; and the testing of advertising copy. Characteristic methods include: rating scales, questionnaires, extended ("depth") interviews, group discussions, panel tests, "in-home" product tests, controlled observation and actuarial studies of consumer behavior. For a review of recent trends in consumer psychology, see Perloff (1968). See *Marketing; Occupational psychology*.

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Mass., 1940. Smith, P. C. & Cranny, C. J.: Psychology of men at work. Ann. Rev. Psychol., 1968, 19, 467-96.

G. D. Wilson

Industrial relations. 1. Human relations between all the members of staff of an industrial concern as well as their relations with the management and their own work; sometimes defined in legal and tariff provisions (labor regulations); 2. Less commonly used to denote the relations between an industrial concern and the public (See *Public relations*). Not to be confused with *labor relations*, i.e. the relations between an industrial concern and the trade union organizations.

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G.R.W.M.

Infancy. 1. *General.* Usually the period during which the child cannot yet speak, from birth till twelve or thirteen months. Characteristic signs of this period are: development of the body and posture, development of the sensorimotor apparatus; the initial learning of emotional attitudes (attraction to the mother, anxiety); an inability to move from place to place of one's own accord, voluntarily to control behavior, to speak, or to achieve an autonomous adaptation (q.v.). This period lasts longer in human beings than in other creatures.

The *maturation* of the nervous system, as a continuation of the biological development of the embryo, determines the course of the following advances: (a) the reduction of sleep periods (from six to seven periods in twenty-four hours to one to three periods at the age of one year); (b) bent and floppy limbs become straight and firm; (c) disappearance of the "archaic reflexes" through the development of the cerebral cortex; (d) sitting with support at about four months, without support at about seven months; standing with help in the eighth month, without help in the thirteenth month; walking

holding on at about eleven months, walking alone at about fifteen months.

At first the infant holds a thing just in the palm of his hand, then the thumb is bent sideways over it in about the fourth month. Binocular vision is fully attained in about the sixth month, when turning the head toward a sound source also develops. In the second month the infant can fixate moving objects, the first conditioned responses appear in connection with suckling, and he smiles at faces; in the third month he recognizes people. From three to six months he learns to watch his hands moving, to grasp things which he sees and which arouse his curiosity. At about four months he makes noises directed at other people (social noises), and, at about five months, he begins to "complain". From the sixth to the eleventh month he begins to explore objects: at first impulsively, and then to relate their different sensuous and spatial qualities (surface, relative position); shyness at strangers and the joyful recognition of members of the family, as well as involuntary imitations, begin at about seven months. From ten to thirteen months, after the infant has developed a concept of objects and discovered their "permanence" (he will look for them when they have disappeared behind a curtain), he arranges objects in relation to one another, and organizes his movements in accordance with the findings he remembers. "Instrumental (practical) intelligence" develops; he voluntarily imitates sounds and movements, and at about thirteen months can play "let's pretend"—the first sign that he is approaching the stage of symbolic imitations.

2. *Developmental mechanisms.* The important aspects here are the combined operation and significance of the *instincts, bodily maturation, learning* and interpersonal relationships. Sucking, walking, grasping and posture all have an instinctive component, but require practice in adaptation and social encouragement, and can therefore take very different forms (e.g. in "feral" children, q.v.). It used to be held that smiling at someone and certain

echopraxias in the first month indicated a *social instinct*. But it is difficult to distinguish between the influences of the instincts, of maturation and of conditioning (q.v.). Conditioning can begin in the second month: situations which are associated with pleasant feelings (contentment) are reinforced; those which have aroused unpleasant feelings are feared.

Recognition of objects and persons, exploration, the realization of wishes, and the earliest form of understanding are founded upon this mechanism. However, one must also take into account the role of *circular reactions* (J. M. Baldwin, 1906): The infant is excited when he observes that his movements have caused something to happen and therefore repeats the movements. At the age of six months, even complex reactions obey this law of circularity (J. Piaget). Initiatory behavior develops in accordance with the same principle, and by playing noise and movement games with the parents. Circular reactions constitute an important source of differentiations and of discovery in the infant's exploration of his environment.

Affectivity plays a dynamogenic (i.e. initiating or changing motor responses through sensory activity) and regulating role. It develops in interpersonal reactions, principally between the infant and his mother. (See *Hospitalism*; A. Freud, R. A. Spitz, J. Bowlby). The mother appeases or gratifies urgent needs, stimulates activity by showing him things and playing with him, arouses expectations, impatience and laughter (at six months); she requires "goal-directed" behavior by teaching and showing him how (at about nine months). But she also frustrates, forbids and provokes. From the sixth month onward, strangers cause shyness, then anxiety. Psychoanalysts (N. Hartman, E. Kris) hold that object cathexis takes over from the narcissism (q.v.) of the first three months in two major phases: interest in persons (and in situations which announce these "objects"), followed by attraction to and communication with others. These object cathexes are

essential to the formation of a balanced ego (q.v.) distinct from the world. The reactions of the first ten months are basic to the formation of permanent behavior patterns: e.g. (a) the desire to "make things happen" is strengthened by its connection with the suckling relationship, and later with motor skills; (b) the infant's increasing interest in sensorimotor experience leads him after ten months to regard his own image in the glass without clearly understanding the significance of what he sees; (c) his dependence upon his mother can turn through frustration (q.v.) to aggression (q.v.); (d) the affirmation of the self (q.v.) in opposition to another in the form of protests (and—after ten months—intentional provocations) is the precursor of speech.

The formation of and part played by these modes of behavior vary from infant to infant (Meili 1957; Escalona, 1968). Differences in activation (q.v.) level determine a bold or fearful approach to the environment, and therefore elicit different responses to the familiar environment: in this way definite character traits are formed. See *Arousal*.

The behavior of the person responsible for bringing the child up, and the methods used, depend upon culture and tradition. A. Kardiner, M. Mead, J. W. M. Whiting and E. H. Erikson indicate the personality (q.v.) differences caused by strict or relaxed methods of early care. The factors which determine the infant's behavior are numerous; they may be complementary or conflicting. On the one hand there is bodily (neurological) maturation (Gesell, 1934), and on the other the influence of emotional relationships. But conditioning (q.v.) (see *Learning theory*) and the active initiatives of the child, either in motor behavior (Piaget, 1952) or in emotive expressions (Wallon, 1934), must be taken into account. The interaction of these factors has still to be clarified. See *Child psychology*; *Development*; *Instinct*; *Traits*.

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Infantile sexuality. Freudian psychoanalysis (q.v.) divides sexual expression in both sexes in early childhood into various phases: the oral phase (first year of life), the anal-urethral stage (second to fourth year—bowel training, q.v.; see *Anal stage*) and the phallic stage (q.v., fourth to seventh year) characterized by the development and overcoming of the Oedipus complex (q.v.). This early expression of infantile sexuality is said to become latent again with the maturation of the superego, until puberty—when the adolescent usually seeks heterosexual partners outside his own family.

Developmental biology might be thought to confirm certain aspects of psychoanalytical theories: in the "larval stage" of infancy there is already a hormonal difference between boys and girls. Sucking, and erection in the boy, arouse pleasure. Early childhood curiosity includes sexual questions, and children (especially in the third and fourth years) examine their genitals as part of the general process of self-exploration and understanding. Attempts at coitus are not uncommon in play. Subsequent psychosexual health depends in large measure on the

examples given to children and on the security of a harmonious marriage and family environment. See *Child psychology: Sexuality*.
K.T.

Infantile type. An individual in whom physical development has been arrested altogether (or more frequently, in part) at a childish stage of development (see *Retardation*). The term is also used in characterology since mental immaturity often goes hand in hand with physical retardation. See *Hypermaturism*.
W.K.

Infantilism (syn. *Juvenilism*). 1. If an individual fails to attain that degree of somatic growth and sexual development appropriate to his age, infantilism is said to be present. This condition is not to be confused with *dyarism*, in which a failure of somatic growth may be accompanied by normal sexual development. Due to endocrine hypofunction (particularly of the pituitary or its connections), chronic infection, ocellar disease, renal disease, cyanotic heart disease, or is idiopathic. Intellect is not impaired, although emotional development and behavior patterns commonly retain childish characteristics.

2. The term also has psychoanalytical connotations, meaning the state of infancy.
J.F.

Infantilism, psychosexual. A distinction is sometimes made between general *apertism* (q.v.), which affects the whole organism, and partial or *psychosexual* infantilism: non-development of the secondary sexual characteristics, or immaturity of the sexual organs compared with the development of the rest of the body.
J.L.I.

Infant tests. Methods which attempt to describe behavioral development as a whole or specific areas of behavior from the first

month of life onward, e.g. Binet-Herter tests (q.v.) for children of 0 to 6 years. See *Development tests: Gesell Development Schedules*.
J.F.-K.

Infection, psychic. A sociopsychological phenomenon, stimuli are transmitted directly from individual to individual; in the simplest case this involves conscious reference, but opinions and attitudes may also be concerned. On a larger scale "psychic epidemics" may occur, e.g. rapidly propagated excitement as a reaction to music with a strong beat. See *Humorism law: Crowd behavior: Attack: Stereotype*.
S.W.

Inference. 1. A conclusion drawn from antecedent arguments or propositions accepted as true, which may be deductive or inductive. See *Deduction: Induction*. 2. The process of drawing such a conclusion.

Inferential statistics. The theory and methods of statistics (q.v.) as applied to the "inferring" of population parameters from sample values and distributions.
W.F.B.

Inferiority complex, inferiority, feeling of. Adler (q.v.) bases his psychotherapy on the concept of the inferiority complex. The self-realization of any human being is already colored in childhood by universal feelings of inferiority which serve to motivate a compensatory trend toward superiority. The expression "inferiority complex" connotes the weaknesses which occur in every individual and may be real or imaginary, physical, psychological or social; the term also indicates the strong tendency which exists to seek completion and reality.
J.L.I.

Infertility. 1. The temporary or permanent inability of an organism to produce offspring

(sterility). 2. The tendency for an individual or group to produce very few offspring.

G.D.W.

Infibulation. The stitching together of the external female genitalia (vulva or prepuce), usually in order to prevent copulation.

Inflation. The personality is "flooded" with unconscious factors or identifies with them (C. G. Jung). The clinical consequence is generally an acute psychosis. See *Psychoses, functional*.

W.Sc.

Influence. 1. That which produces an effect. 2. Directive or modifying power (e.g. in interpersonal relations). 3. To exert influence.

Informal group. See *Group*.

Information. The general term "information" (a synonym for news, communication) has been developed through the analysis of technical data transmission systems and communications networks into one of the basic concepts of information theory (q.v.) and cybernetics.

Starting from the principle of information transferal through technical devices with an information source (transmitter or sender), transmission channel, and receiver, problems of maximum utilization and development of foolproof codes have been examined. Information measurement according to C. E. Shannon and N. Wiener (after preliminary studies by Nyquist, Gabor and Küpfmüller) measures the invariant aspect of telecommunications in codings and signal transmissions (e.g. conversion of acoustic into electrical signals). The information of a communication, sign or event defines its news or novelty content, or more precisely its *improbability*. A sign with the probability p has the information:

$$i(p) = 1d \frac{1}{p}.$$

The mean information is the mean of a repertoire of r signs weighted with the individual probabilities:

$$H = \sum_{i=1}^r p(i) \cdot d \frac{1}{p(i)}.$$

In stochastic dependence, calculations are made with the limited probabilities.

Information can be interpreted as the length of the communication with optimal coding in a binary code. The information contained in one bit (q.v.) corresponds to a binary code sign or a selection process from two (equally probable) alternatives.

Because of the formal similarity with the expression for thermodynamic entropy, the mean information is frequently referred to as *entropy* (q.v.), or *negentropy*. Thermodynamic entropy is a measure of the state of order of, or degree of randomness in, a physical system, and indicates the proportion of thermal energy which cannot be converted into mechanical work at a given temperature difference in a thermal or caloric engine.

The concept of information is used not only in communications and regulation technology, but whenever the function of complex systems or the interaction between several systems implies informational processes. See *Cybernetics and psychology; Information, psychology of; Cybernetic education*.

Statistical information, objective information, syntactic(al) information and selective information are synonymous terms. Statistical information emphasizes the derivation from statistical characteristics; objective information the possibility of determination by external observers; syntactic(al) information the exclusion of the semantic aspect; and selective information the function of the source in generating sign sequences by selection from an ensemble of signs.

Structural information, metric information: depending on the structure of the signals (q.v.), different aspects of information dominate. Data can be conveyed in an equivalent manner by continuous signals, e.g. current fluctuations in the telephone, or by discrete

signals, e.g. current impulses in a telex. In discrete signal sequences the information consists of the number of signals and their mean information. Similarly, in continuous signal sequences, the information consists of the number of distinguishable temporally sequacious signal values, and the stages distinguishable at a given degree of measurement accuracy (i.e., to a certain extent, the repertoire) of disjunctive signal values. According to D. M. McKay, the number of distinguishable signals in a signal sequence is referred to as *structural information*, whereas the information of the individual signal value is known as *metric information*.

Topological information: the information of three- or two-dimensional arrangements which can be converted into temporal signal sequences by scanning during information transfer. In topological information, a distinction is again made between structural information as the number of distinguishable grid cells and metric information derived from the intensity values of the individual cells.

Subjective information: the information content of a message for the receiver can be determined only in relation to the internal state of the receiver. In principle, this rule applies to technical receivers. In psychology, the transition to the concept of subjective information is important (K. Steinbuch, H. Frank, A. Charkewitsch, K. Weltner). It implies a change in the theoretical premises, to the extent that information is now derived from the expectancy probabilities of the receiver which are determined in turn with the help of rate tests (Shannon, Attneave, Weltner). They enable the subjective information of given complex linguistic and other data to be studied as a function of their context, situation, attitude of the receiver, linguistic and factual understanding, and other psychological parameters.

The transition to the concept of subjective information enables not only the statistical but the *semantic* (the "information of meanings") and the *pragmatic* aspects (the

information of behavioral changes elicited by data) to be analyzed. Differentiation therefore enables the semantic component of linguistic data to be isolated from the total information content by measuring the subjective information for two states of the percipient class: (a) significance of the unknown information; (b) significance of the known information.

Didactic information: in cybernetic education the amount of semantic information in the matter to be learnt; the matter must be available in verbalized form as a basal text. The information remaining when the meaning of the basal text is known is referred to as "esthetic information", which is therefore defined negatively as "non-didactic information", and constitutes a measure of the uniqueness of a particular presentation.

Theoretically precise analysis of *semantic information* is possible only on the basis of unambiguously defined language systems. Appropriate methods are to be found in the theory of logical-semantic information developed by R. Carnap and Y. Bar Hillel. See *Communication; Information theory; Instructional technology; Semantics*.

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K. Weltner

Information analysis, multidimensional (syn. *Multivariate information transmission*). A method described by McGill for analyzing the relationship between multidimensional (multivariate) stimulus-response sequences with the aid of information theory (q.v.), and dividing the information content of the responses into transinformation of stimuli and random components. Multidimensional information analysis may be interpreted as non-parametric analysis of variance.

Bibliography: McGill, W. J.: Multivariate information transmission. Psychometrika, 1954, 19, 97-116.

K.W.

Information capacity of the sense organs. The upper limit of the information flow between the receptors and the projection center of the cerebrum is determined by the specific information capacity of the sense organ concerned. The following values (in bits/sec.) have been determined: optical channel: $3 \cdot 10^6$; acoustic channel: $2 \cdot 10^4$ to $5 \cdot 10^4$; tactile channel (with reference to the whole body surface): $2 \cdot 10^5$; olfactory channel: 10–100; gustatory channel: 10.

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Information, density of. If data are not transmitted as a sequence of signals in time, the quantity of transmitted data is indicated not as an information “flow” (q.v.), but as an information “density” which shows the number of code elements required for coding on a line, a surface, or in a given space. The density of information is measured in signals/cm (cm^2 or cm^3). The density must be determined, e.g., when adapting pictorial material to the capacity of the eye. H.R.

Information, esthetics of. The esthetics of information is a branch of esthetics which makes use of the concepts of information theory (q.v.) and information psychology (q.v.). The informational aspect of esthetic processes is subjective and may be described as a process of gradual acquisition; the object of esthetic perception must contain elements of surprise (information) and initially unknown as well as known organizational structures. For a summary of the field, see Bense (1969); for the basic semiological inspiration, Barthes (1967); for the psycholinguistic basis, Chomsky (1957).

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London, 1967. Bense, M.: Einführung in die informationstheoretische Ästhetik. Hamburg, 1969. Chomsky, N.: Syntactic structures. The Hague, 1957. Garnier, P.: Spatialisme et poésie concrète. Paris, 1968. Uhr, L. (Ed.): Pattern recognition. New York, 1966. Wathen-Dunn, W. (Ed.): Models for the perception of speech and visual form. Cambridge, Mass., 1967. K.W.

Information flow. Information flow is determined as the quantity of information transmitted through an information channel per unit of time. It is measured in “bits/sec.” The upper limit is determined by the channel capacity. The concept of information flow has been adopted by information psychology (q.v.) and applied to communication (q.v.), learning, and perception. H.R.

Information processing (syn. *Data processing*). Any process by which received data are modified or associated with other data on the basis of specific laws so that new data are available as a result. In control, regulating or adaptation processes, this may lead to changes in the receiver's behavior. Information processing also includes the reception and transmission of data. The term “data processing” is often used only to refer to methods involving the use of a computer. When all the procedures in a system are bound up with a computer, the term “integrated data processing” (IDP) is applicable.

Bibliography: Feigenbaum, E.: An information processing theory of verbal behavior. Santa Monica, Calif., 1959. Id. & Feldman, J. (Eds.): Computers and thought. New York, 1962. P.B.H.

Information processing systems. A general term for all systems in which data are processed. A system of this kind can associate several different items of data on the basis of rational laws and obtain new information as the result. In general, organisms which absorb information from the environment (stimuli) and derive behavioral

changes from that information can be considered as information processing systems.

P.B.H.

Bibliography: Hunt, E. B.: *Concept learning: an information processing problem*. New York, 1962.
Norman, D.A.: *Memory and attention: an introduction to human information processing*. New York, 1969.

Information psychology. Information psychology represents an attempt to use cybernetic approaches, methods, measurements (in particular that of information) and models in psychology with a view to developing a complete theory.

Information psychology—originally conceived as a psychological basis for the esthetics of information—uses introspection as an indicator of phenomena which are arranged in an (initially qualitative) scheme (an “organogram”) appropriate to the psychologically relevant aspect of the human information process. Cybernetic concepts and models (see *Cybernetics and psychology*) are also employed for descriptive ends, and the parameters used are determined quantitatively in experiments. Beyond this *descriptive* stage, the models also allow of quantitative or qualitative, empirically testable conclusions: the explanatory stage. The ultimate stage of the program of information psychology is an abstraction of all “inessential” details, and therefore the restriction of all assertions to a general cybernetic “psychostructural” model. The criterion for the “essential” is appropriateness to the proposed application (which occurs, in particular, within the framework of cybernetic education, q.v.). A series of increasingly complex psychostructural models is used in (largely programmatical) exact information psychology to obtain an approximation to man as a psychologically apprehensible existent.

Various experiments have shown (at least on average) an approximately linear relationship between reaction or perception times and the information content of stimuli. This

allows the inference of a maximum reception speed (“apperception speed”) of approximately 16 bits/sec. (achieved only at app. twenty years of age) for new consciously apprehended data. At the same age, the information absorption speed of the memory reaches a maximum of about 0.7 bits/sec. Several experiments have also shown that after habituation to a given probability distribution of a repertoire of signs, the subjective receptivity to a symbol reaches a peak at an occurrence probability of $p = 1/e$ (app. 37%). This “maximum effect” is explained by information psychology with the maximum of the function $p \cdot i = p \cdot \log_2 \frac{1}{p}$, i.e. with a value proportional to the apperception time. The resulting measurement for incidence has proved accurate both in the quantitative interpretation of the results of frequency ratings and in predictions of the statistical influence of examples on apparently free behavior patterns. So far, however, the approaches of information psychology have proved unsatisfactory for determining the repertoire of signs and probabilities (accommodation of information), and for constructing memory models in regard to the learning of semantic information. Above all, the suggested methods for incorporation of motivation in the model have proved inadequate.

Information psychology is, of course, essentially concerned with *models* of psychological events that are of more or less practical value. See *Instructional technology*; *Machine learning*; *Simulation*.

Bibliography: Frank, H.: *Kybernetische Grundlagen der Pädagogik*. Baden-Baden, ²1959. (See also *Information theory*.)

H. Frank

Information reduction. The reduction of subjective information into processing data on the basis of informational accommodation and superordination by forming classes or complexes. Information reduction can help to reduce reaction times.

H.R.

Information system. All the connected means of communication employed within an organism, group or organization.

Information test. A test to estimate an individual's general or specific knowledge.

Information theory. 1. *Development.* Information theory came into being because of problems arising in connection with the transmission of information by technical systems (telegraphy, telephone, wireless). As early as 1924, H. Nyquist (1932) and K. Küpfmüller showed that for electrical transmission systems there was a quantitative connection between the band width of the transmission channel and the maximum speed of the signal. Further developments by C. E. Shannon (1948) led to information theory in its present form, which, as a part area of cybernetics as established by N. Wiener (1948) (see *Cybernetics and psychology*), is also formally connected with the inferential statistics (q.v.) of R. A. Fisher (1925). The fundamental problems are the transmission of signals, news and measurement values and the control of interference.

Shannon & Weaver (1962) deal with the problem of the optimal exploitation of communication chains and networks featuring interference, and base their theory on the objectively observable properties of signal (q.v.) or sign (q.v.) sequences. Relevant areas are the development of interference-free codes, the theory of signal transformation, and the accurate estimation of reductions in channel capacity for idealized degrees of interference.

Information theory is equivalent in many of its aspects to R. A. Fisher's inferential statistics, in so far as Fisher deals with the exclusion of interference (causal disturbances, or "noise") from measurements. Starting from the calculation of probable error (normal probability curve), inferential statistics made it possible to exclude interference

from measurement data (division of disturbances into—arbitrary—classes of random and systematic errors which then become observational variables), and extended the field of relevant empirical research in education, psychology and sociology.

N. Wiener (1948) took as his starting-point the interaction, adaptation and stability of systems coupled to an unstable environment (see *Cybernetics and psychology*; *Feedback system*; *Homeostasis*). The exclusion of interference from measurements and information processing were seen as prerequisites. The result was cybernetics, which has information theory as one of its components.

2. *Theory.* The basic idea is information (q.v.) as a quantitative measure for signs (q.v.) or signals (q.v.) which are exchanged between a sender (source, transmitter, emitter) and a receiver (recipient). Sign sequences are selected by various processes from a repertoire (ensemble) available to the sender. The sign sequence can be transmitted by different physical signals (q.v.). From the repertoire of signs used, their frequency, and the selection-restrictive, statistically expressible links between the signs (*stochastic processes*, q.v.; *Markoff processes*, q.v.; grammatical rules: see *Grammar*) a measurement value is obtained for the information; it remains valid for any number of recodings (see *Code*) and signal transformations (q.v.).

In the restricted sense in which it is used in information theory, information—as a *logarithmic measure of infrequency*, or negative value of the (conditioned) probability of occurrence—is a measure for the novelty or "news" value of the sign. It is arbitrary but useful to take the two as a basis of the logarithm. Then the unit—one bit—is the amount of information of a choice of two equally probable outcomes (tossing a coin). Accordingly one bit in data processing denotes a point of a binary data medium which gives the maximum storage capacity (q.v.) of a store.

The structural content of continuous signals can also be measured. A prerequisite

of mathematical information theory is the *ergodicity* of the source, i.e. its statistical properties must remain constant and independent of the point at which a sample is taken.

It is of particular interest that *unequivocal and reversible codings without loss of information* are possible not only from discrete into discrete signs (words into letters, letters into teleprinter code), from continuous into continuous signs (sound vibrations into electrical vibrations, brightness values into current values), but from discrete into continuous and from continuous into discrete sign sequences. The continuous course of a temporal (electrical oscillation) or spatial function can be replaced by a sequence of discrete numerical values if these reproduce the functional values at equidistant intervals. The distance of the intervals must be reduced in proportion to the speed at which the value of the function changes (quantal theory). Conversely, the continuous curve can be recovered from the sequence of numerical values.

Important as it is for its technical uses, this system of transfer opens up new prospects for the marginal conditions of stimulus perception and processing in biological and physiological systems (psychophysics, q.v.). In these, too, continuous physical stimuli are coded into impulse and discharge sequences of neuron(e) networks (see *Decision processes*).

When there is no interference with information transmission, an unequivocal relationship is established between the signal as it is sent and as it is received. When there is interference in the channel, the signal as it is received does not always correspond to the signal as it was sent. The information correctly received—transinformation (T)—is smaller than that which was sent. The difference—the information lost—is “*equivocation*”. The information produced by interference is “*irrelevance*”. Channel capacity (C) (q.v.) is determined by band width (B) (difference between the highest and lowest transmissible

frequency). With a disturbed channel (almost always present), the channel capacity diminishes with an intensity proportional to that of the noise compared with the intensity of the signal.

An unexpected result of information theory is that, even in a disturbed channel, any required degree of transfer reliability can be obtained by suitable coding; then transmission speed can reach almost full channel capacity. This is surprising, since the known technical methods of interference exclusion relied on the use of control signs and, in the most trivial case, on the repetition of the data, thus producing redundancy (q.v.) artificially, and reducing transfer speed.

3. *Tasks and applications.* The measurement units and methods of information theory form the bases of data technology, data processing, theoretical optics and picture transmission (Gabor, 1950, 1963), cybernetics (Frank, 1970; Steinbuch, 1965; Wiener, 1948), and technical automation.

In addition, information theory opens up new prospects in fields in which coupling and interaction between complex systems can be regarded as a whole or in part as informational coupling. When stimuli are perceived, conducted and processed, signals are coded and decoded. Sign recognition of signs and gestalt perception may be treated as interference- and irrelevance-exclusion. Learning may be regarded as the construction of internal models by way of informational links (see *Cybernetic education*). Social processes are apprehended by measuring the entropy (information) of groups (Cube & Gunzenhäuser, 1962).

In its purely mathematical form, information theory excludes the semantic and pragmatic aspects of communication, which have to be considered when analyzing interference which has disturbed vocal or optical human intercommunication chains or networks. Such analysis requires a transition from the concept of statistical analysis to that of subjective information, which is concerned with the internal state of the

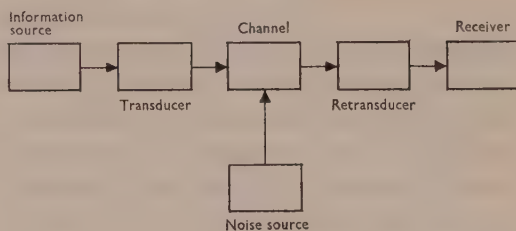
receiver. In this transition, information measurement now refers not to an objective statistics (q.v.) of sign sequences which can be determined by an external observer, but to the empirically determinable probabilities expected by the percipient (Weltner, 1970). This opens up new areas of application for information theory in the analysis of the linguistic aspects and content of perception processes, and in the analysis of cognitive and learning processes, using a combination of empirical methods and the theoretically grounded measurement and relational system of information theory. In this process certain problems arise which cannot yet be treated in isolation: e.g. relevance, or the repertoire of possible references available to the perceiving recipient. See *Communication; Instructional technology*.

Bibliography: Attneave, F.: Applications of information theory to psychology. New York, 1959. Beer, S.: Decision and control. London, 1966. Bellman, R. & Kalaba, R.: Mathematical trends in control theory. New York, 1964. Borko, H. (Ed.): Computer applications in the behavioral sciences. Englewood Cliffs, N.J., 1962. Brillouin, L.: Science and information theory. New York, 1956. Clapp, L. C. & Yilmaz, H.: Optical information processing. In: Colborn, R. (Ed.): Modern science and technology. New York, 1965. Cube, F. v. & Gunzenhäuser, R.: Die Entropie von Gruppen. Quickborn, 1962. Frank, H.: Kybernetik-Brücke zwischen den Wissenschaften. Frankfurt, 1970. Gabor, D.: Communication theory and physics. Phil. Mag., 1950, 41, 1161. Id: Inventing the future. London, 1963. Gibson, E. J.: Principles of perceptual learning and development. New York, 1969. Langer, D.: Informationstheorie und Psychologie. Göttingen, 1962. Loehlin, J. C.: Computer models of personality. New York, 1968. Mackay, D. M.: Quantal aspects of scientific information. Phil. Mag., 1950, 41, 289. Meyer-Eppler, W.: Grundlagen und Anwendungen der Informationstheorie. Berlin & New York, 1969. Minsky, M. (Ed.): Semantic information processing. Cambridge, Mass. & London, 1968. Nyquist, H.: Regeneration theory. Bell Syst. tech. J., 1932, 11, 126. Peters, J.: Einführung in die allg. Informationstheorie. Berlin—Heidelberg—New York, 1967. Pierce, J. R.: Symbols, signals and noise. London, 1962. Quastler, H. (Ed.): Information theory in psychology; problems and methods. Glencoe, Ill., 1955. Rose, J.: Survey of cybernetics. London, 1970. Rosenblatt, F.: Principles of neurodynamics. New York, 1961. Shannon, C. & Weaver, W.:

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K. Weltner

Information transmission (syn. *Information transfer; Information transferal*). The transfer of information with the help of an information medium (see *Signal*) from a transmitter to a receiver. Information (or data) transmission follows the pattern below (communication chain):



An information source generates data consisting of a sequence of signs (symbols). The latter are converted into transferable signals in a transducer. The signals pass through a data channel or transmission medium to a retransducer which reconverts the received signals and conveys them to the receiver. The noise source comprises all the interference to which the signal is subject on transmission.

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P.B.H.

Information transmission, multivariate. See *Information analysis, multidimensional*.

Infrared. Electro-magnetic radiations of a frequency just below that of red (103–106 mμ) and therefore outside the visible spectrum. Radiant heat is transmitted in this frequency range.

C.D.F.

Infrasonic. Sounds below the frequency range detected by the ear (1/1000—16 Hz). These sounds can sometimes be detected by other senses as tremors or rhythmic beats. They may be produced by winds, earthquakes, and so on. C.D.F.

Inheritance. The combination of genes resulting from the fusion of the parents' cells during fertilization; in a wider sense the totality of the genetic factors which determine the structure and development (q.v.) of the individual in conjunction with environmental (q.v.) influences. See *Abilities; Differential psychology; Traits; Type*. M.A.

Inhibition. I. Curtailment, constraint, prevention. A characteristic of central nervous systems which is ultimately a major factor in recognition. The *spatial* extension and *temporal* sequence of excitation (nerve impulses) released by stimuli are influenced by inhibition as well as facilitation and summation processes.

1. *Local (lateral) inhibition.* The specific path originating at the receptors and running to the projection cortex is interconnected collaterally to adjacent synergistic synapses (see *Synapse*) so that an impulse tends to heighten a strong adjacent impulse, whereas a strong impulse inhibits the weak adjacent impulse. This locally effective contrast system steepens the local excitation gradient by comparison with the stimulus intensity gradient. In general, the organism is governed by the principle that a nucleus of excitation in the information transmission system of the sense organs is always accompanied by an environment with lateral inhibition. Lateral inhibition is primarily important for contrast in the eye (spatial system), and is used only in the higher central nervous layers in the ear (temporal system); in the case of the eye, lateral inhibition of neuronal "on" elements and lateral activation of neuronal "off" elements are essential for contrast recognition.

2. *Temporal inhibition.* Two parallel information channels within the specific pathway from the receptor to the cortex are so interconnected that the channel with the stronger excitation, or—after coding—with the faster action-potential sequence and shorter latency, blocks both channels through an inhibition control neuron, allowing only the first signal of the faster action potential sequence to pass; the remaining signals and above all those in the information channel which is not so strongly energized are completely suppressed.

In the acoustic sense-organ system, temporal inhibition is used, e.g., to suppress a succession of two sound stimuli in a time range in which the time difference is used for a spatial stimulus characteristic, namely the direction of the sound source.

Similarly, temporal inhibition is observed in the acoustic sense-organ system in the sense that specific action-potential intervals in a more or less completely irregular sequence can be suppressed. M. Spreng

II. In neurophysiology, inhibition is the prevention of specific nervous processes; inhibition may also denote the processes which give rise to such suppression, and which are frequently considered to be among the basic activities of the central nervous system and are interpreted as the opposite factors to excitation. In *psychology* the term is used to denote certain phenomena or the processes on which they are (hypothetically) based, above all in the psychology of memory, in the psychology of learning (see, e.g., Pavlov, 1928; Hull, 1943; Harlow, 1959; Eysenck, 1970), and in clinical psychology (q.v.) with a depth-psychological (see, e.g., Freud, 1936; Schultz-Hencke, 1951) or behavior-therapeutic orientation (see e.g. Salter, 1949; Wolpe, 1958; see *Behavior Therapy*). Although the shades of meaning sometimes vary considerably, inhibition is always the prevention or curtailment of a behavioral process

by an activity of a different kind; it is generally assumed that the inhibited function may continue when the inhibiting factor has been removed.

The significance given to inhibition processes in the social or performance (achievement) context differs widely from author to author, and sometimes even within a given system. Harlow and, in certain cases (primarily differential inhibition), Pavlov attach considerable importance to the notion of inhibition, e.g. as the basis of all higher mental processes.

Reciprocal inhibition, according to Wolpe, is an essentially neutral mechanism, while internal inhibition, according to Pavlov, and reactive inhibition, according to Hull, are close to the concept of fatigue and also emphasize a possible protective function. Inhibitions of memory are generally considered to be performance-reductive influences on learning processes. In clinical psychology the need to acquire specific inhibitions in the socialization (q.v.) process is stressed, while at the same time (and more frequently) attention is drawn to the high probability of negative personality development through excessive inhibition of spontaneous impulses (Schultz-Hencke, 1951; Salter, 1949).

Studies of the associations between neurophysiological and behavioral "inhibitions" are still in their infancy. See *Arousal; Behaviorism; Conditioning, classical and operant*.

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L. Blöschl

Inhibition, internal (syn. *Inner inhibition*).

In I.P. Pavlov's behavioral theory "internal inhibition" is a term for a group of inhibition phenomena characterized in that they are caused by changes in the conditioned association itself and, unlike the various forms of unconditioned inhibition, are acquired in learning processes. "Internal inhibition develops when the conditioned stimulus is not attended by the unconditioned, whether this be once or always, but in the latter event, only under certain circumstances. Thus come about extinction, retardation, conditioned inhibition, and differential inhibition. We see then that the same conditions are necessary for the development of sleep as for the development of internal inhibition." (Pavlov, 1928.) The following are the most important forms of internal inhibition:

1. *Extinction*: if a conditioned stimulus is not applied repeatedly, the conditioned response gradually ceases to occur. That this is inhibition and not elimination proper is shown by the results of many experiments (spontaneous restoration of the extinguished conditioned reflex after a long delay, etc.).

2. *Differential inhibition*: if one of two similar stimuli, but not the other, is applied repeatedly, the second stimulus is (differentially) inhibited as a special case of extinctive inhibition. See *Conditioning, classical and operant; Inhibition; Orienting reflex*.

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Inhibition potential. See *Conditioned inhibition*.

Inhibition, social. A term for the absence (or presence in a modified form) of certain—usually aggressive—modes of behavior toward members of the same species. E.g. rats when *feigning* combat do not bite or display the threat gestures which precede serious fighting. See *Appeasement gestures; Aggression*. V.P.

Inhibition type (syn. *Inhibitory type*). More difficult to excite and less capable of achieving

high performance than the excitatory, or excitement type (q.v.); conditioned reflexes are weak and unstable; changeable. "There stand out three well-defined types of nervous systems; the central or equilibrated, and the two extreme types, the excitatory and inhibitory. . . . The melancholic is evidently an inhibitory type of nervous system" (Pavlov, 1928). See *Type*.

Bibliography: Pavlov, I. P.: Lectures on conditioned reflexes, Vol. 1. New York, 1928. *W.K.*

Inhibitory potential (cumulative). See *Conditioned inhibition*.

Initiation. A term taken from the Latin *initiatio*: a beginning, and used in ethnology (q.v.) to denote *rites* performed when a juvenile is received into the adult community. "Puberty rites" is another term with the same meaning. In many tribal cultures where there is no knowledge of writing, initiation rites are of greater significance than marriage. In our culture "confirmation", parties after a school-leaving examination, etc., are feeble reflections of initiation ceremonies (Hofstätter, 1963). In contrast to the vestiges of initiation rites we possess, which all relate to some achievement, the authentic rites in their highly-developed forms also perform such functions as heterosexual "education" and confirmation of sex roles by means of, e.g., circumcision (q.v.) ceremonies (e.g. the removal of the girl's clitoris or the boy's foreskin). Initiation and initiation rites emphasize the break between childhood and adulthood, and at the same time link the two chief periods in life (Chapple & Coon, 1942).

Instruction in tribal knowledge and certain skills (tribal history, mythology, mysteries, dances, pipe playing, etc.), tests of courage and self-control (piercing the nostrils, frightening experiences, etc.) serve to show whether the young member of the tribe is suitable for adult status, and at the same time to prepare him for the concomitant rights and duties.

Symbolic representations and magico-religious actions play a significant part (death and rebirth) in initiation. In general, initiation does not necessarily coincide with biological sexual maturity, and can extend over several weeks or months.

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Innate (syn. *Inborn*). **1.** That which is present at birth. **2.** Some difference between individuals which is not attributed to environmental influence. See *Differential psychology; Drive; Instinct; Traits*.

Innate releasing mechanism (abb. IRM). The instinctive, selective readiness of an animal to respond to a "releaser", or specific sign- or key-stimulus (q.v.), with a specific reaction. This hypothetical physiological (neurosensory) mechanism works as a "stimulus filter" by checking the reaction in inadequate situations. See *Imprinting; Instinct*.

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Inner speech (syn. *Internal speech; Inner language*). Inner speech is unvoiced speech, a function in itself, and the basic form of thinking in words. The philosophers of antiquity had already noted that "thinking is speaking to oneself in silence". Plato was the first of many philosophers, linguisticians and psychologists who have tried to develop this judgment, some even going so far as to assert (unjustifiably) that thought and spoken language are one, or (in one version of behaviorism) that thinking may be defined as "subvocal" processes in the larynx (Watson, 1920; ³1929).

Early studies of the phenomenon of inner speech were grounded on introspection (q.v.) and clinical observations of speech disorders (i.e. different forms of aphasia, q.v.). On the basis of these observations, inner speech was conceived as "verbal images" of various modalities (acoustic, motor and visual), a deficit in which could be explained in terms of aphasic dysfunctions of thought processes (disturbances of speech comprehension in sensory aphasia and of verbal memory in motor aphasia). Several theories were put forward: a motor basis for inner speech (G. Stricker, 1880); an acoustic basis (Egger, 1881); or a mixed basis (G. Ballet, 1886). In addition, visual forms were characterized as optical images of letters and schematic visual images of objects (A. Lemaitre, 1905). The Würzburg psychologists (K. Bühler, 1907-8), however, argued that perceptual mental images and verbal images did not play any essential role in thinking, and were mere sporadic phenomena.

Experimental research into inner speech is obviously very difficult because of the covert nature of all its processes. The most advantageous course would seem to be an investigation of the motor (kinesthetic) components. At first (1900-25), inadequately sensitive pneumatic and mechanical devices were used in attempts to record the micro-movements of vocal organs (Curtis, Wyczoikowska, Thorson, *et al.*). In addition, some researchers used various methods of suppressing or inhibiting external and internal articulation (A. Binet, E. Meumann, Pintner). The results of these experiments allowed of more than one interpretation; hence covert articulation was viewed not only as a general but as an individual factor in thought. The use of more sensitive recording devices (at first the string galvanometer, and later the electromyograph) made possible more exact results which indicated an increase in the tonus of the vocal musculature during all verbal functions involving difficult thinking. It was also shown that the EMG (electromyograph) potentials recorded under such conditions are local

speech potentials and not merely the result of diffuse irradiation of muscular tonus. These investigations were pioneered by E. Jacobson (1929-32). The EMG method was used afterwards to study the thinking of the deaf (Max, 1937), thinking in acoustic schizophrenic hallucinations (Gould, 1948-9), in attentive hearing (Smith, Malmo & Shagass, 1954; Wallerstein, 1954), in silent reading (Faaborg-Andersen & Edfeldt, 1957-9; Hardyck *et al.*, 1966), and in verbal and perceptual problem-solving (Sokolov, 1957-68).

The results of these more recent investigations show a considerable variation in linguistic EMG reactions, which is independent of the difficulty and novelty of the conceptual problems to be solved, the degree of automatization of the thought operations to be carried out, the introduction of images (percepts and mental imagery) into mentation, and the individual inclination to a specific memory type. Vocal motor impulses are detectable not only in verbal-abstract but in "visual" thinking, even though they are weaker, or even inhibited or reduced during phases of intensive visual object-analysis. Subsequently, however, there is the phase of covert vocal motor reactions, which neither conclude nor correct the thought process. On the basis of electromyographic data it may be assumed that the main function of vocal motor (proprioceptive and tactile) afference in thinking is probably motor reinforcement or "activation" of the speech mechanisms of the brain in accordance with the "feedback" (q.v.) principle. This accords with Pavlov's (1941) conception of kinesthetic stimulations of the speech organs as the bases or fundamental components of speech, which is a second system of signalization in humans, signaling the first unified signaling system of the animal, and primarily the human, organism.

In Soviet psychology (q.v.), the problem of inner speech has been exhaustively examined in connection with a critique of the Würzburg and the behaviorist conceptions of thought. A general survey of this problem and of relevant

experimental findings is available in Sokolov (1968, 1969). See also *Language; Mental imagery; Psycholinguistics; Vygotsky*.

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A. N. Sokolov

Innervation. 1. Anatomical: the development of nerve fibers in the organism. **2.** Physiological: the provision of nervous stimuli, in particular the conduction of central impulses to the effectors through (innervating) nerve fibers. In general, a distinction can be made between innervation by afferent (centripetal), efferent (centrifugal) and vegetative (sympathetic and parasympathetic) nerves. Exteroceptors and interoceptors are involved in innervation, which is regulated by the central nervous system (q.v.)

F.-C.S.

Input. 1. The energy flowing into a system. **2.** The actual stimulus or signal received. In information theory (q.v.), a living being can be considered as an information channel (communication channel) or as a complex information system. Stimuli comprise the input and responses the output. Information theory models are frequently used to represent and interpret cognitive behavioral patterns (e.g. thought, speech). One such model is the TOTE unit (Miller, Galanter & Pribram, 1960), which includes the feedback concept. Plans (e.g. expectations) are constantly compared with environmental data. If the "plans" are considered as system states and environ-

mental data as (information) input, the environmental influence is compared with the system state. If the two coincide a response is made (output). "Stimulus and response must be seen as phases of the organized, coordinated act . . . Stimulus and response must be considered as aspects of a feedback loop." The stimulus is seen not as preceding but as guiding the response.

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H.W.

Insanity. This term is *not* now used as a synonym for psychosis but is reserved for a medico-legal condition, namely a mental disorder which results in the patient not being responsible for his actions, or in his being unaware of the consequences of his actions. See *Mental defect; Psychoses, functional; Schizophrenia*.

R.H.

Insects, state-forming (syn. *Social insects*). With the aid of very complex instinct (q.v.) patterns, a highly sophisticated form of social behavior has developed in certain groups of insects (hymenoptera, termites); a convergence of behavior is observed between certain species. The selective advantage for these social species consists, as in a human culture, in the possibility of answering the demands of life more rationally through the division of labor, which is determined by external influences: according to the mode of nurture, insects develop as sexually mature or retarded workers and soldiers. State-forming bees possess an unusual learning capacity and highly complex modes of exchanging information. See *Dancing language*.

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H.Sch.

Insight. 1. An individual's conscious knowledge or understanding of himself or others. See *Empathy; Introspection*. 2. An immediate understanding of a real or logico-mathematical relationship. Gestalt psychology conceives the process of insight as an organization of events such that structural relationships in the phenomenal *field* (q.v.) change in accordance with the particular phenomenon. The result of such a process is often the familiar "inspiration" or "sudden idea". (See *Aha experience*.)

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Insomnia (syn. *Agrypnia*). Chronic sleeplessness. First investigated by K. von Economo (1917) after an outbreak of epidemic encephalitis in Europe during World War I, which led to a reversal of the normal sleep-waking rhythm. Those suffering from the affliction are awake at night but sleep during the day. Insomnia is to be distinguished from difficulty in getting to sleep and disturbances of sleep. It is neurophysiologically conditioned by hyper-activation of neuron(e) complexes located in the reticular formation. Insomnia frequently occurs in healthy individuals as a disorder of diverse causation (over-arousal, hyper-stimulation from optical and acoustic sources, effects of caffeine ingestion). It often accompanies depressive and schizophrenic states, but can also occur in internal disorders, e.g. cardiac insufficiency, angina pectoris, high blood pressure, hyperthyroidism, etc. In old age, the sleep-waking rhythm becomes irregular; after approximately age fifty, arteriosclerotic changes can induce insomnia in about fifty per cent of individuals. See *Sleep*. *D.V.*

Inspiration. Originally a theological term: a divine influence, or a condition in which God manifests himself to man in a supernatural manner. Some psychologists have described inspiration as the manifestation of a "second-

dary personality" concealed in the unconscious. This personality is said to have great creative potential and to allow certain sensitive, intraverted individuals to proceed to unique achievements. Sometimes used as a synonym for genius (q.v.). See *Abilities; Creativity; Meditation*. *E.U.*

Instinct. Instinct as a word derives from the Latin *instinctus*, from *instinguere*—to incite. In some uses, the word has referred to particular behavior patterns and coordination, but it is in the sense of a basic biological urge that the concept has had greatest influence. All animals maintain themselves by ingestion, digestion and elimination, and all species survive by means of reproduction. Fundamentally, the concept of instinct merely states this. Attempts to elaborate the concept, in particular the incorporation of ideas concerning innateness and subjective, purposive phenomena, have been considered controversial. Indeed the concepts of innateness and purpose are themselves as complex and confused as that of instinct.

1. *History.* The concept of biological urge or inner drive, for which the word instinct is generally used, has a history in classical antiquity. In post-Wundtian psychology the most influential instinct theorists were James (q.v.), Morgan and McDougall (q.v.), who wrote in the early part of this century, but their general influence did not extend beyond its first two decades. Freud (q.v.), the founder of psychoanalysis, is an exception, but his influence as an instinct theorist has continued only outside the mainstream of psychology.

A swing away from instinct and a pre-occupation with behaviorism (q.v.) and the problem of drive (q.v.) occurred in psychology during the 1930s and 1940s. Apart from Tolman (q.v.), no influential theorist wrote on instinct, and even Tolman's following was achieved in the context of drive rather than instinct theory.

During its period of decline in psychology, work on instinctive behavior in animals was

still being undertaken, mostly on the continent of Europe. The term ethology (q.v.) is now used to describe this work, carried out independently of psychology in a tradition of biology and natural history. Through the influence of this ethological work, a revival of interest in the concept of instinct occurred in comparative psychology during the 1950s. Ethologists and psychologists took renewed interest in each other's work, and the cross-fertilization of ideas has generated new research in comparative psychology (q.v.), but without, however, any widespread revival of interest in the concept in general psychology. (See *Animal psychology*.)

2. *Scientific use of the instinct concept.* Since the theory of evolution is common to all biologically oriented sciences, it is convenient to consider the scientific use of the concept as starting with Darwin. He, and others after him, have used the concept of instinct to account for behavior which is usually complex, adaptive, and often finely attuned to particular environmental conditions. Such behavior is often performed with an appearance of intelligence and aimed, with what appears to be purposiveness, toward particular goals, even though the capacities of the organism concerned make it impossible to attribute such intelligence.

No fully adequate explanation can yet be offered, in terms of physico-chemical events or known biological mechanisms, for much of this kind of behavior, particularly as it occurs in insects, fish and birds. Until research has filled obvious gaps in our knowledge, the concept of instinct will continue to be used to meet these deficiencies.

Three major scientific trends in the literature on instinct are the psychoanalytic, psychological and ethological. All have proposed models in attempts to account for instinctive behavior. Ethological models are most specific and closely linked to empirical phenomena, whereas the psychoanalytic model is more general and difficult to test empirically.

3. *Psychoanalytic views of instinct.* Ac-

cording to Freud, an instinct has a particular force or impetus to action. The aim of the action is to abolish the source stimuli creating the impulse, and this can be achieved in or through some object, which can vary according to its satisfying properties. Central to much of Freud's theorizing were the concepts of conflict (q.v.) and equilibrium, representing dynamic forces whereby aims and objects of instinctive behavior could be altered by repression, or sublimation. Although this represents a model of behavior, its link with reality lies in observations of clinical patients. It has proved difficult, though not impossible, to test these ideas empirically. Also, such motivational ideas as are present in Freud's scheme, in so far as they have been incorporated into general psychology, have been considered as drives rather than instincts. (See *Drive*.)

4. *Psychological views of instinct.* Psychological theorists have proposed that instinct involves some internal state disposing an organism to respond selectively to certain kinds of environmental objects or events. This basic impulse is alleged to be innate and to involve subjective, purposive excitement directed toward the ends or goal of the behavior. According to this view, an instinct is an inborn, conative-affective system.

Because of the general acceptance of the concept of evolutionary continuity existing between animals and man, it has been held that the instincts, which form an obvious part of the behavior of animals such as insects, must exist also in man. In man, however, expression of the instinct is considered to be infinitely variable.

McDougall (q.v.) was undoubtedly the most influential psychologist to write on instinct, and his books, written early in this century, were widely used in its early decades and continued in print as late as the 1950s. His system of instincts and their associated sentiments had greatest appeal to social psychologists, among whom, until relatively recently, ideas concerning social interaction seemed less amenable to empirical tests,

probably because his ideas seemed simple and direct. McDougall was, however, and not without justification, criticized as confusing description with explanation.

With the hardening of behaviorist attitudes in psychology (see *Behaviorism*), the use of the concept of innateness was avoided as an inferior substitute for detailed behavioral analysis and subjective phenomena ruled out of scientific analysis. Most phenomena previously considered instinctual were redefined as drive (q.v.). The term drive was relatively free from the related concepts of innateness and purpose, yet covered many of the essential features of instinct. Apart from some areas of comparative and developmental psychology, where psychoanalytic and ethological ideas are influential, the concept of instinct is now largely ignored in psychology.

5. *Ethological views of instinct.* Ethological views of instinct, whilst owing much to the theory of evolution and to early American and European naturalists and zoologists, derive principally from the integrative work of Lorenz and Tinbergen.

Two important organizing influences stem from this work. The first is that rigid, stereotyped behavior patterns, characteristic of much instinctive behavior in animals, are potentially of equal value in taxonomy, as are structural and other factors. The second is that behavior is caused by energy specific to particular instinctive acts of fixed action patterns. When an organism, through the agency of search-like appetitive behavior, meets appropriate environmental stimuli for which the animal has special receptor and perceptual releasing mechanisms, the act is released and specific energy is dissipated. A special appeal of the energy model was that by distinguishing between appetitive behavior and the instinctive act, it could account for achievement of a set goal by variable means without incorporating the idea of purpose, because performance of the act itself was considered to be the goal.

If an animal does not meet with appropriate environmental stimuli, the energy

builds up until it results in spontaneous performance of the act despite the absence of appropriate stimuli. This has been called vacuum activity and, in the examples of this kind of behavior which ethologists have described, it has the appearance of behavior performed inappropriately. Another form of inappropriate behavior has been called displacement activity. In an animal prevented from performing some instinctive act in a normal way, energy appropriate to that act is displaced, resulting in behavior inappropriate to the animal's current needs. This ethological model and attendant concepts have generated a large body of research in the field of animal behavior. The model has been severely criticized, in particular the vacuum and displacement activities, important empirical evidence for the energy model being increasingly accounted for in other terms. Concepts associated with the energy model, however, such as sensory and perceptual releasers, displacement activities and fixed action patterns, in revised form, are likely to continue to be used in behavioral analysis.

6. *Current status of the instinct concept.* A dispassionate appraisal of the current status of the concept of instinct is difficult. Considerable research activity is taking place on problems which could be described as proper to instinct, though use of the concept as such is not much in evidence. In particular, recent ideas on and research into critical periods in early behavior, whether imprinting (q.v.), primary socialization or early experience, have direct antecedents in psychoanalytic, psychological and ethological views of instinct.

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P. L. Broadhurst & J. Wilcock

Instinctive action; instinctive behavior. See *Instinct*; *Innate releasing mechanism*.

Instinct-taxis association (syn. *Instinctive motor co-ordination*). According to Lorenz, an instinctive action consists of innate co-ordination (a relatively rigid pattern of muscular contractions) and the taxis (q.v.) components which direct the action.

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Institutes of psychology. When psychology asserted its independence as an empirical and predominantly experimental discipline in its own right, a great number of university institutes and departments of psychology were established as research and teaching centers: e.g. 1879 (a milestone in the history of psychology) Leipzig, by W. Wundt (q.v.); 1881, Göttingen, by G. E. Müller (q.v.); 1883, Johns Hopkins, by G. S. Hall (q.v.); 1888, Pennsylvania, by J. McK. Cattell (q.v.); 1889, the Sorbonne, by H. Beaunis and A. Binet (q.v.); 1886, Kazan, by V. M. Bekhterev (q.v.). Important schools of psychology developed at several of these institutes (e.g. the Berlin, Leipzig and Würzburg Schools). At present, individual university institutes of psychology tend to feature a wide variety of psychological specialisms. Other institutes without any direct university connections are making an increasingly large contribution to research (e.g. the Max Planck Institutes in Germany).

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Institution; institutionalization. A sociological concept used by H. Spencer to denote, e.g., ideas and establishments which take into account the interests or value judgments of a large cultural group through special forms of

social interaction, e.g. education, marriage, property, etc. A distinction may be made between, e.g., domestic, sacred, political, professional, economic and other institutions which cover the means and activities considered necessary by a larger group to achieve specific ends. Parsons works on the basis of the internalization of values and standards with which several groups conform. If this conformity leads to satisfaction and causes others to accept these standards, this value or system of standards can be defined as "institutionalized". According to Parsons, an institution is therefore a complex of institutionalized role characteristics or status relationships which is structurally significant for the given social system and its maintenance. See *Group*; *System, social*.

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Institutionalized children. Institutionalization (in the sense of the substitution of a state or voluntary home for the natural or foster parents) can have a particularly harmful effect on young children (see *Hospitalism*; *Inanition*). Some studies have shown clear differences between children raised in institutions and those brought up in a family environment; these differences apply at the level of intellectual development, or that of the degree of voluntary cooperation and school progress; children brought up in institutions experience considerable difficulty in establishing and maintaining social contacts. *M.Sa.*

Instruction. 1. Directions given to the testee regarding his behavior in the experimental or test situation; he should also be motivated to conform to these indications. Even minor changes in initial instruction can lead to statistically certain differences in the test results. The tone of voice and gestures of the

psychologist or experimenter during instruction can also affect results to some extent.

2. Authoritative teaching; indoctrination (q.v.). 3. Systematic teaching. See *Instructional technology*.

Instructional technology. The study of learning should provide knowledge that can be used in designing an instructional environment and in the educational process. However, scientific findings and theories are rarely available immediately for practical use; translation and development are required for their possible application. As the study of learning becomes increasingly relevant to educational problems, an understanding is required of the relations between basic and applied science, and development, that lead to the methods and technology which can be used by the practicing educator to design conditions for learning.

The recent history of the experimental psychology of learning displays a cyclical progress toward contact between scientific endeavors and technological development. In the nineteen twenties and thirties, the work of L. Thorndike (q.v.) showed an exemplary concern with the implications of psychology for educational science (q.v.). In addition to his basic studies on the law of effect and on verbal learning, Thorndike wrote extensively on educational psychology (q.v.) and the psychology of school subjects. Following Thorndike and his associates, the psychology of learning entered a period (1940-45) of decreasing emphasis on school learning, and increasing attention to laboratory experiments and theoretical elaborations based upon them (Melton, 1941; Estes, 1960). But, beginning in the late 'fifties, experimental psychologists have been turning their thinking and their enterprises to the analysis and investigation of the educational, instructional process (Skinner, 1958; Bruner, 1960; Lumsdaine & Glaser, 1960; Bugelski, 1964; Hilgard, 1964; Suppes, 1964; Gagné, 1965; Gibson, 1965; Gilbert, 1965; Glaser, 1965;

Groen & Atkinson, 1966; Moore & Anderson, 1968).

At the present time, an instructional technology based upon an underlying science of learning is emerging. Technology in this sense does not necessarily mean hardware and instrumentation, but rather an applied discipline like engineering or medicine. The techniques and procedures used by the practitioners of these technological disciplines grow out of the findings in their underlying sciences, and also develop by informing science of their needs. The major impetus for the emergence of this field of instructional technology was provided by B. F. Skinner (1954, 1958), who recognized the work of Sidney L. Pressey in the 'twenties (Pressey, 1926). While both Pressey and Skinner thought and conceptualized in terms of the broad application of behavioral science to education, their initial developments centered upon self-instructional devices as a way of making concrete certain principles of learning, and as a way of providing tools and instrumentation around which instructional innovation could take place. It is often mistakenly believed that the devices themselves, and the specifics of the early crude apparatuses, formed the major contribution. In his 1958 article, Skinner emphasized the importance of the principles of programming and the possibility of a scientific technology for instruction. Whereas an important contribution of the field of programmed instruction and instructional technology is the development of materials and instrumentation to extend the capabilities of a teacher as an instructor and the student as a learner, the field is not restricted to these products. Work in instructional technology is extended to the general design of educational environments, including teacher practices, classroom organization, and so forth (Skinner, 1968; Bruner, 1960; Hilgard, 1964).

1. *Psychological bases for instructional design.* At the present time, research and development in the field of instructional technology can be characterized in terms of

the following areas: analysis of the behavior to be learned; diagnosis of the characteristics of the learner; specification of the conditions for learning; and the assessment and optimization of the outcomes of learning.

2. *Analysis of the behavior to be learned.* A body of knowledge consists of information and of processes: information includes data, facts, concepts, and rules; processes refer to the cognitive abilities and intellectual skills by which this information is manipulated and transformed for the purposes of acquiring new knowledge and carrying out intellectual performances. From the viewpoint of instructional theory and practice, the presence of competence is inferred by reference to the behavior of an individual. For example, we infer that a student knows certain principles of physics because he can describe them, identify their application, and recall and use them where appropriate. The informational content of a body of knowledge, the ways in which this information is interrelated and structured, and the ways in which it can be processed must be analyzed and understood before the conditions involved in the acquisition of this knowledge can be meaningfully studied and implemented. As a consequence, an increasingly prominent feature of the psychology of learning is the analysis and classification of the behavior to be learned.

A particularly prominent technique for the analysis of structures of knowledge has been presented by Gagné (1962). This analysis begins with a desired instructional objective, stated in terms of student behavior, and asks in effect, "to perform this behavior, what prerequisite or component behavior(s) must the learner be able to perform?" For each behavior identified, the same question is asked, thus generating a hierarchy of behaviors based on identifiable and measurable prerequisites. Analysis of this kind attempts to provide an ordered set of tasks for inclusion in an instructional sequence. Such analyses observe the basic constraint that no objective is taught to the learner until he has met the prerequisites which facilitate learning and

transfer to the next objective. These prerequisite learnings can be achieved in a variety of ways; some individuals can learn them one at a time, and others learn a number of them in larger steps. The instructional process is optimized by continuous identification of the furthest skill along the hierarchy that a student can perform at any moment; or, if a student is unsuccessful in performing a particular task objective, by determining the most immediate sub-objective at which he is successful. These hierarchies indicate transfer relationships between the elements of increasing knowledge or task competence, and make explicit what behaviors are to be observed and tested for.

The relationships between units of learning establish the subject-matter structures that are learned, e.g. concepts, rules, principles, and strategies. With increasing knowledge and with the increasing maturity of the learner, these units of behavior become progressively larger. At certain phases in the acquisition of knowledge, a structure can become a unit of a higher structure. For example, consider the progression of phases in a child learning to read. Assuming that the child has learned to speak, the first phase in the process is the discrimination of graphic symbols (printed letters). In the second phase, these discriminated objects are encoded, or mapped onto language, so that spelling-to-sound (grapheme-phoneme) correspondences are acquired. At this point, relationships are established between the discriminated symbols and speech units. In later phases, the student learns to read not letter-by-letter, but by words and paragraphs, and the previously learned units become part of higher-order structures. Such structures determine the content of a subject-matter learning that is manifested in competent subject-matter behavior; and psychological research in instruction has as a basic requirement the identification of the units and structures involved in subject-matter performance (Gagné & Gephart, 1968; Gibson, 1965, 1969). In addition to analyzing the structures

of advanced knowledge, one must also determine those units and structures which serve optimally to facilitate learning for the novice (Bruner, 1964). This means that a technology of instruction must specify the ways in which a body of knowledge can be organized so that it can be most readily grasped by the learner as he progresses to more advanced competence.

3. *Diagnosis of the characteristics of a learner.* Detailed diagnosis of the initial state with which a learner comes into a particular instructional situation is necessary to further his education. In the early stages of instruction, teaching procedures adapt to the findings of this initial assessment. In this concern with initial measurement and diagnosis, an important distinction must be noted: traditional measurement practices have assumed, essentially, a "selection model" of instruction in which the aptitudes of a student are measured and used to predict his success in a relatively uniform instructional environment. In contrast, the present concern in educational technology and programmed instruction is to establish different conditions and procedures for learning, depending upon the initial state of the learner. The direction necessary to take for this purpose has been pointed to by Cronbach (1957) and by Cronbach & Gleser (1965), i.e. to move toward decision-making procedures based upon relationships between the entering behavior of a learner and the variables manipulated in instruction. Measures are taken on the basis of which a decision can be made as to what instructional environment an individual should select in order to optimize his attainment of learning outcomes.

For the most part, measures of general aptitude and general intelligence measures do not seem likely to be the most useful bases for differentiating and adapting instruction because they correlate with success in most instructional methods. As a result, psychologists are now very actively investigating the interaction between entering behavior (aptitude) measures and learning variables.

Fleishman (1965, 1967) carefully studied the learning of psychomotor skills. Fleishman compared the contribution of the various abilities tested at the beginning of learning to performance scores on successive learning trials during practice and showed that the particular combinations of abilities change as practice continues, and that the different abilities existing before entering a learning task influence learning at different learning stages. The implication is that individuals with different patterns of abilities require different learning experiences at different stages of learning. In the area of verbal learning, Jensen (1966, 1967, 1968) suggested certain variables of human performance that appear to interact with the learning of verbal tasks. General reviews and analyses of the field of aptitude-method interactions have been reported by Bracht & Glass (1968), and Cronbach & Snow (1969). (See *Abilities*.)

4. *Specification of the conditions for learning.* In attaining subject-matter knowledge and intellectual skill, the learner proceeds through a novitiate and then on to relative expertise; he learns to be a good reader, a competent mathematician, a deep thinker, a quick learner, a creative person, an inquiring individual, and so on. These activities are learned according to criteria of expertise established by the school and intellectual community; more specifically by subject-matter requirements, peer group expectations, and the general social and professional criteria for what determines low, average, and high levels of competence. The educational and social community adjusts its expectations to the competence level of the learner, so that initially very awkward and incorrect performances are acceptable whereas later they are not; a young child or a novice is frequently rewarded for rather uninteresting behavior but as competence grows, his performance is attended to only in the presence of an appropriate audience or in an appropriate situational context. The process of going from ignorance to competence, from novice to expert, establishes a useful way of looking

at the processes and characteristics of instruction.

Four general properties of behavior appear to distinguish the performance of the beginner from that of the expert: (a) The responses of the learner move from variable, awkward, and crude to consistent, relatively fast, and precise. Responses develop from simple unitary acts into large response integrations and overall strategies. (b) Subject-matter stimuli change from specific instances to members of response classes, and the invariance of these classes becomes the major stimulus event. Stimulus contexts change from simple ones to complex patterns in which relevant must be distinguished from irrelevant aspects, and information must be abstracted from a context of events which are not all appropriate. (c) Behavior becomes increasingly symbolic and covert in the form of mediational responses and information-manipulating processes. The learner responds increasingly to internal representations of an event, to internalized standards and to internalized strategies for thinking and problem solving, all of which are manifested in terms of his behavior as an expert. (d) This behavior of the expert becomes increasingly self-sustaining, increasingly masterful in terms of his skillful use of the rules when they are applicable, and subtle bending of them in appropriate situations. Increasing reliance is placed on one's own ability to generate the events by which one learns and the criteria by which performance is judged and valued.

The process of instruction is concerned with implementing this growth from ignorance to competence, and the characteristics of the course of this growth determine the design of the instructional environment. As the learner interacts with the environment, certain lawful psychological processes influence the way in which this interchange (e.g. Hilgard & Bower, 1966; Skinner, 1968; Hilgard, 1964; Glaser, 1970). The conditions provided for instruction are determined by the properties of the behavior to be learned, the characteristics of the learner, and the

nature of subject-matter competence. The task of an instructional technology is to design conditions for learning based upon knowledge of the learning process and upon techniques of instruction. As appropriate behavior is learned, new conditions are set up to maintain it, and use it to develop more competent and subtle behavior. A complex repertoire is taught through a series of environmental changes, during each stage of which the learner responds to extend his present competence and to prepare himself to respond at a later, more complex stage. The particular properties of the competent behavior acquired depend upon the details of the instructional environment provided in an educational setting, such as teacher practices, textbook design, teaching machines and instructional materials, peer-student interactions, and the learning skills of the student himself.

5. *Assessment and optimization of learning outcomes.* With knowledge of learner characteristics and with alternate instructional procedures available, adaptation is made to the student's performance, i.e. his mastery of prerequisites, rate of learning, requirements for amount of practice, degree of structure and prompting, scheduling of reinforcement, and so on. Different individuals are assigned to (or the student may assign to himself) different instructional conditions. These initial placement decisions reflect only initial assignment, and are corrected by further assignments as learning proceeds, so that allocation to instructional procedures becomes a multi-stage decision process defining an individual instructional path. As a student proceeds to learn, his performance is assessed at appropriate intervals, and measures of this performance are summarized and indexed. The kinds of measures of learning progress one usually obtains, and on which instructional decisions are made, consist of test-score information which measures the frequency of correct responses, errors in relation to some performance standard, and the speed of

performance. The use of measures of transfer and generalization are particularly to be encouraged. Of special interest are measures which can be obtained in the course of learning and may be predictive of future learning requirements. Work along these lines has been reported by Jensen (1966, 1967, 1968), Zeaman & House (1963), Rohwer & Levin (mimeo), and Judd & Glaser (1969).

An adaptive instructional process employs a reiterative pattern of assessment and instructional prescription where decisions are made sequentially, and decisions made early in the process affect decisions made subsequently. The task of instruction is to prescribe the most effective sequence of learner-environment interactions. Problems of this kind in other fields of endeavor have been tackled by optimization procedures (e.g. Wilde & Beightler, 1967). The optimization problem of major concern is finding a decision procedure (to be implemented by the student, teacher, and/or a teaching device, see: Atkinson & Wilson, 1969; Holtzman, 1970) for deciding which instructional alternatives to present at each stage of instruction: given the instructional alternatives available, the set of possible student responses to the previous lesson unit, and specification of the criteria to be optimized for the judgment of competence. For this, two research and development tasks are essential: First, obtain rigorous knowledge of how the system variables interact; second, obtain agreed measures of system effectiveness. The first task is to determine the kinds of experimental studies and learning theory that are most useful for discovering the relationships between individual differences and learning variables. The second task refers to the fact that criterion measures of what is to be optimized become critical. In this regard, extensive work is in progress in measurement theory and technique as related to the instructional process and learned achievement (Glaser & Nitko, 1971; Cronbach, 1963; Bormuth, 1969). This work involves techniques for the development of

criterion-referenced measures of achievement in contrast to the more commonly used norm-referenced measures (Glaser, 1963; Ebel, 1962; Flanagan, 1951; Popham & Husek, 1969). Criterion-referenced measures are tests constructed to yield measurements that can be directly interpreted in terms of specified performance standards, rather than relative standards such as percentile scores or normal-curve standard scores. Serious attempts are also being made to measure what has been heretofore so difficult—those aspects of learning and knowledge that are basic to an individual's capability for continuous growth and development, including transfer of knowledge to new situations, problem solving, and self-direction.

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- R. Glaser*
- Instrumental conditioning.** See *Conditioning, classical and operant.*
- Insufficiency.** 1. Inadequateness to some end or purpose. 2. A want of some ability, value, substance, etc. 3. An individually felt inadequacy or feeling of *inferiority* (q.v.) is described by Adler (q.v.) in the context of individual psychology (q.v.) as an important factor in the origin of neuroses. Such convictions of personal inferiority are said to occur in the neurotic personality, even in the absence of organic or mental insufficiency, and to lead to “inferiority complexes”. See *Neurosis*.
- K.Pa.*
- Insula** (syn. *Island of Reil*). The insula forms part of the cerebral cortex. Originally it was situated on the free surface. In the course of development it has moved downward and is covered by parts of the anterior, superior and temporal lobes. It has been suggested that the insula is an association center for acoustic thinking.
- G.A.*
- Insulin.** A hormone (polypeptide) formed in the Langerhans islet cells (beta cells) of the pancreas with the main effect of blood sugar maintenance and control. Whereas adrenalin (epinephrine) mobilizes the stored sugar and introduces it into the blood as glucose, insulin—as an antagonist of adrenalin—promotes the development and storage of blood sugar as glycogen. Insulin deficiency leads to hyperglycemia (diabetes mellitus), and an increase in insulin secretion to hypoglycemia. Since 1963, insulin has been

synthesized and can be administered intravenously. Few experimental psychologico-physiological studies have been carried out. Low doses of insulin lead to increased heart rate, higher systolic blood pressure and higher respiration frequency, and also reduce diastolic blood pressure. Subjective effects: fatigue, dizziness, hunger. Performance (calculations) is generally impaired. In higher doses, insulin causes hypoglycemic shock, and was used as a means of therapy, e.g. in schizophrenia (q.v.).

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Insulin shock (syn. *Insulin coma; Insulin therapy*). A state of hypoglycemic shock or coma (in which the patient is unconscious) induced by administering insulin parenterally until the blood sugar is reduced to a certain level (hypoglycemia). The method has been replaced by drug therapy, primarily because the same therapeutic objective can be achieved by neuroleptics with less risk of complications.

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Integrated type. According to E. R. Jaensch, this type is characterized by a holistic attitude and wide-ranging attention; he thinks holistically and organically and is capable of change. Ant.: *disintegrated type*. The integrated type had three further sub-groups, depending on whether the orientation is directed more strongly inward or outward. W.K.

Integration. In the *central nervous system* (q.v.) stimuli are processed by various means: enormous numbers of neuron(s) of a few morphological types form synaptic networks. No less than 300,000 synapses converge at a Purkinje(s) cell in the cerebrum. Information is conveyed to chemical synapses (q.v.) through transmitter substances (noradrenalin [norepinephrine], acetylcholine, serotonin, GABA); electrical synapses function directly. Nerve cell bodies (soma) and dendrites integrate on the analogue principle through algebraic, electronic summation while nerve fibers integrate digitally on the all-or-nothing principle with pulse frequency coding. Chemical and electrical fields influence the statistical characteristics of large cell groups. A flow of stimuli with enormously high redundancy (in the order of a million bits/sec) is filtered and grouped (convergence and divergence networks); the frequencies are raised or lowered while feedback loops have a throttling effect. Plasticity is dependent on the reserve of neurons which can be physiologically activated. Hormones influence the stimulus thresholds of neurons. Neuronal excitation circuits store data for a short time while the long-term memory functions with chemical engrams (proteins, nucleotides, amino-acid sequences).

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Integration of the personality. 1. The consistency, or degree of coincidence, with which diverse individual processes or actions, and in particular the decisions of a human being, prove effective in functional dependence on each other; or the coordination of characteristics in a given situation or in contact with the environment. If we adopt A. H. Witkin's theory that the personality is an open system, i.e. closely related to the environment,

integration denotes the functional relations between the system components. This integration is attributed to a complex system and therefore presupposes differentiation of the system. 2. The making whole of the personality, either through one's own efforts (i.e. in individual development or in self-therapy, or under psychotherapy (q.v.). See *Person; Personality; Type*. W.D.F.

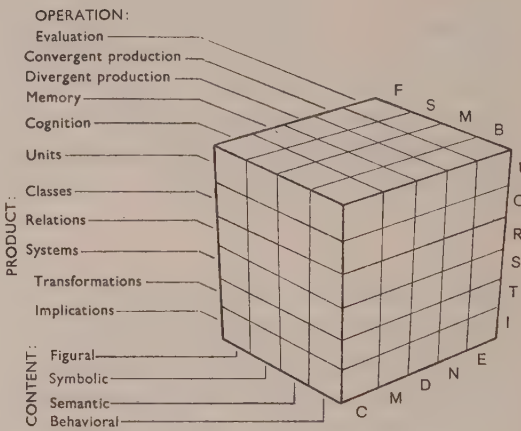
Integration, social. A general term for part processes which are necessary to complete or establish a consistent social structure. These processes include (especially in Talcott Parsons' theory): *cultural integration* as the essential consistency of normative factors; *normative integration* as the essential correlation between standards and requirements; *communicative integration* as the essential smooth transmission of standards from one individual to another; and *functional integration* as the essential harmony of requirements, expectations and actual behaviors. W.D.F.

Intellect. 1. The perceiving, cognizing, understanding mind. 2. The power of understanding. 3. Comprehension. 4. Whatever that mental ability may be which enables man to think. 5. High-level abstract or conceptual thought. See *Intelligence*.

Intellection: The act of understanding; using (the) intellect. H.W.

Intellect, structure of. The structure of intellect (i.e. intelligence) can be determined from a number of different standpoints (see *Intelligence*). In the factor-analytical sphere, the concept of the structure of intellect has acquired a special meaning as a system of factors which determine intellectual performance. A particularly well-known model for the structure of intellect or intelligence has been suggested by Guilford (1959, 1967). He distinguishes between three aspects of every act of the intelligence: operation,

product and content, and also describes various modes of variation, or categories, of each dimension. In addition to the categories "figural", "symbolic", "semantic", Guilford posits a fourth category (purely theoretical) along the dimension of content, designated as "behavioral" and representing the general area of "social intelligence. Guilford's theoretical model represents (i.e. predicts) 120 distinct abilities in a cube, each cell containing a kind of problem and the corresponding factor. "If education has the general objective of developing the intellects of students, it can be suggested that each intellectual factor provides a particular goal at which to aim." (1959.)



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Intelligence. However clearly we may seem to understand what is meant by intelligence, e.g. in connection with an intelligence test, there is as yet no generally recognized definition of the term. Admittedly intelligence denotes an "ability", i.e. a condition or a complex of conditions for specific performances or achievements. But the specific types of performance which require intelligence have not yet been unambiguously defined, except to the extent that the term covers cognitive problems. Ideas on the

essential, "inner" nature of this ability are even more divided. The definition of intelligence as the ability to overcome difficulties in new situations (proposed almost simultaneously by E. Claparède and W. Stern) is most widely accepted today. Since animals too can adapt to new situations for which they have no instinctive solution (W. Köhler's "intelligence tests on anthropoid apes"), thought cannot be considered to be an essential criterion for the exercise of intelligence.

1. *Research into intelligence.* There are close links between research into intelligence and the psychology of thought (processes) inasmuch as intelligence is considered as a prerequisite for individual variations in thinking; nevertheless, the two branches of research have developed separately. The aim of intelligence research is to use statistical comparisons to determine the conditions underlying various types of performance. The degree of similarity between the conditions for two types of performance is determined by correlative techniques. After 1900, Spearman (1927) was the first to develop on this basis a method of analyzing the relations between performances; his method of factor analysis (q.v.) has since been used in almost all intelligence research. These studies need not be confined to typical intellectual performance. It is largely a matter of linguistic convention which of the factors is defined as intellectual. The main problem in this research was to determine the number and nature of the factors involved. Spearman developed the two-factor theory, according to which all intellectual (in the broad sense) operations involve a single, common factor (general factor, or *g*) and a specific factor for each performance. This general factor can therefore be defined as "general intelligence", although Spearman interpreted it hypothetically as general mental energy. Since research eventually showed, however, that there are certain common features between certain types of performance which are not dependent on "g", the "hierarchical theory" of intelligence was adopted by

Spearman's school. This theory assumes that there are also factors of ever-decreasing effect in the hierarchical order down to Spearman's specific factors (Vernon, 1961).

Thurstone (1938) offered a new factor model in the nineteen thirties: this provides, in addition to the specific factors, for *group factors* (but no general factor) each of which is responsible for one class of performance. Thurstone defined seven primary factors (verbal comprehension, numerical, spatial, reasoning, perceptual speed, verbal fluency, memory). With the widespread development of factor analysis, a very large number of factors have been defined (more than two hundred), which are not always wholly distinct. Guilford, who has carried out the largest number of very extensive factor analyses, suggested a three-dimensional system of one hundred and twenty factors, some eighty-two of which he considered he had defined appropriately before 1967.

Since 1946 Meili has maintained that there are only a few fundamental intellectual factors, and has so far defined four of them (complexity, plasticity, globalization and fluency), which he has verified in many experiments on subjects from the age of seven onward. These factors have been defined similarly by others; according to Meili, at least the first three of these factors play a part in all "acts of the intelligence", even though they do not always significantly determine variance in performance. Meili does not deny the possibility of defining other factors (verbal, numerical, etc.), but believes with Spearman that these are less fundamental, and arise in measure large from practice in dealing with specific types of problem. A decision for one or other of these different models cannot be made by the factor-analytical method, because every correlation matrix can be interpreted in different ways and from different approaches to the psychology of thought.

2. *Intelligence and personality.* In general, intelligence is considered today to be a characteristic, aspect or area of (the)

personality (q.v.). In the first instance, this simply implies that the personality is not completely characterized if intelligence is overlooked. But this is merely an aid toward a definition; it is more important to decide whether there are relations between cognitive and non-cognitive phenomena, the latter including primarily motivational and affective phenomena. The problem must be viewed on different levels: (a) Significant correlations are seldom found between performance in intelligence tests and other personality characteristics determined by means of tests or questionnaires. On the other hand, it is known that test performance may be influenced by motivation, anxiety and certain other personality characteristics. However, since these influences do not apply to all individuals to the same extent and are dependent on the test situation (i.e. are not constant) there is generally no correlation. (b) There seem to be correlations between personality types and forms of intelligence. Kretschmer, for example, has shown affinities between his temperament types and forms of scientific thought and literary production. On the basis of other observations, American psychologists have come to speak of "cognitive styles" (Gardner *et al.*, 1959; Gardner, 1959). They are not concerned with the level of performance but with qualitative characteristics of that performance. As yet it is impossible to decide empirically whether these characteristics can be explained by specific factor constellations, or whether they are based on the influence of non-cognitive conditions. It seems fairly certain that certain factor constellations are associated with interests (Wälti, 1970), and it can be assumed that fluency in solving certain types of problem, or ease of performance in some intellectual activities, may stimulate interest in them. In general, an interaction between the cognitive and non-cognitive spheres must be assumed. (c) On the factor level, therefore, factors obtained by the analysis of operations of intelligence cannot be definitely viewed as wholly intellectual: the possibility that they

are interactive products (Hürsch, 1971) must be considered.

3. *Development of intelligence.* Here a distinction may be made between two lines of research: the quantitative and the qualitative. For a long time there was little doubt that the intelligence or ability required for cognitive performance was innate, and varied from individual to individual. Even if the observable ability for achievement in a given age group was thought of as acquired through learning processes, a varying ability to learn was (with a few exceptions) assumed, and defined as intelligence. This assumption of an initially given disposition or *anlage* (q.v.) then led to the question of the constancy of intelligence during development, and many studies have been made of this problem. In longitudinal studies, the intelligence of the same children was measured at various intervals after the first year of life and it was found that the IQ values (considered measures of intelligence) began to show a certain constancy only from the age of three to four. The results of different studies vary fairly widely, but it can be stated that it is only from the age of eight or nine that the intelligence level achieved at sixteen or seventeen can be anticipated with some accuracy (correlations of more than 0.80). However, since the problems used for measurement in the different age groups sometimes vary widely, this lack of consistency can be explained at least in part by the variations in the test method. Another reason for the poor correlation between IQs at different ages is the irregularity often noted in individual development. It has been found that the development (q.v.) of intellectual performance as reflected in test results, may be modified by environmental influences as by affective and physical factors. The development of intelligence must therefore be considered to be only in small measure a simple process of "growth". It tends rather to be a highly complex process of alteration of the bases of performance.

4. *Nature and nurture.* The old problem of the respective influences of innate traits and

environmental influences has still not been finally solved. The clearest answer (which still leaves certain problems) is provided by twin studies (q.v.). The correlation for intelligence between identical twins is rather more than 0.90. But if the two subjects grow up in a different environment it falls to about 0.75. The correlation for non-identical twins, or brothers and sisters, is still lower (0.54 to 0.62); and if the children grow up in different environments the correlation falls to 0.40 (Butcher, 1968). These figures suggest that the level of intelligence measured in adults is due to environment to an extent of one half or two thirds.

In conjunction with the differentiation of different factors, the question of the constancy of the factorial structure has been raised. H. E. Garrett (1946) formulated a differentiation hypothesis which was converted by G. Lienert (1961) into a divergence hypothesis. According to these hypotheses, an originally unified factor (generally identified with Spearman's "g") becomes differentiated in the course of development, and an increasing number of other factors is formed. In only about one half of some thirty studies of this problem was it possible to confirm this hypothesis. It does seem clear that certain factors associated with the school, such as "v" and "n" occur only later, but a distinction between several factors must already be made at a very early stage. This leads to a distinction between basic or primary and acquired or secondary factors. The structure of the former appears to be relatively constant (Meili, 1970).

5. *Qualitative studies.* The dominant orientation here comes from Piaget. On the basis of research over several decades, Piaget distinguishes between four main stages: (a) the stage of sensorimotor intelligence, up to the age of eighteen months; (b) the stage of preoperational thought, up to the age of about seven years; (c) the stage of concrete operational thought, up to eleven years; and (d) the stage of formal logical operations (or formal operational thought). By "intelligence",

Piaget (1950, 1952) understands a mental structure which, in the course of development, achieves an increasingly comprehensive and perfect state of *equilibrium*. The different stages correspond to structures which Piaget has tried to define accurately (in the case of the two final stages, in the terminology of logistics and group theory). See *Abilities; Differential psychology; Traits; Type*.

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R. Meili.

Intelligence age (Ger. *Intelligenzalter*; abb. IA). The difference between the IA and chronological age (CA) of a subject is the criterion for his advance on, or lag behind, the average intellectual development of other individuals of his age. The "intelligence age" is therefore what is usually known as *mental age* (abb. MA).

A.L.

Intelligence quotient (abb. *IQ*). Suggested by W. Stern in 1912: $IQ = \frac{MA}{CA} \times 100$ (MA = mental age; CA = chronological age). The IQ is a measurement of the intellectual development of a testee in relation to the average value for persons of the same age group. See *Abilities; Intelligence; Intelligence tests*. A.L.

Intelligence, structure of. See *Intellect, structure of*.

Intelligence-structure test (abb. IST). A method of determining the general intellectual achievement level applicable to the 13–60 age group. Amthauer, the author of the test, understands intelligence as “a configuration of mental and psychological abilities”; he believes that his method helps to explain this phenomenon. The decisive feature is the test profile determined from the results of nine subtests each of which in the author’s opinion represents a center of gravity in the structured totality of intelligence. The reliability (according to the halving method) of the test is $r = 0.969$, in the author’s opinion, i.e. significantly high. In determining the validity of the method, correlations were found with teachers’ opinions and school marks of $r = 0.623$ or $r = 0.455$.

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Intelligence tests. The term “intelligence tests” covers psychological test methods designed to determine interindividual differences in the sphere of human intelligence (q.v.). The testee is required to solve a series of different problems of varying complexity; the number of correct solutions gives a quantitative idea of his intellectual (performance) level by comparison with other persons of the same age. Intelligence is generally measured by the intelligence quo-

tient (IQ) which indicates—in its commonest form—the position of S. in relation to the population as a whole on a normally divided scale (mean value 100; dispersion 15). Normally, the designation “intelligence test” implies that the method concerned is assumed to measure “general intelligence” and not partial aspects of the latter. Psychologists are not, however, of one mind as to the performance areas covered by “g”, or its structure; accordingly, the different intelligence tests are sometimes based on highly divergent models of intelligence.

The earliest attempts at a psychological diagnosis of intelligence were made in the nineteenth century. Galton (q.v.) was the first to organize relatively large-scale systematic experiments to detect interindividual differences in the sphere of intelligence. He postulated the standard distribution of intelligence generally accepted today. Pioneering work was done by Binet (q.v.) who published (with T. Simon) in 1905 the first procedures to justify the use of the term “intelligence test” in its present sense. While Binet’s method was designed for educational purposes as an intelligence test for children, the first intelligence tests for adults were developed by military psychologists in America during World War I (see *Army Alpha Test; Army Beta Test*). These methods were suitable for use as group tests and were designed as test batteries; they therefore already possessed two major characteristics typical of most modern intelligence tests. The diagnostic possibilities of test batteries were subsequently extended by adding the psychological profile (test profile) formulated by the Russian psychiatrist G. J. Rossolimo. Going beyond the quantitative determination of a complex of characteristics and the various component parts of the complex (as in the case of a test battery), the psychological profile evaluated the interrelationship between individual subtests on a differential diagnostic basis.

The intelligence diagnosis method owes most of the qualitative improvements it has

undergone to the use of statistical methods. These enabled the tests to be designed scientifically and standardized as measuring instruments. With the help of a statistical method, i.e. factor analysis (q.v.), it proved possible to obtain direct empirical access to the problem of intelligence, and to base intelligence tests on experimental findings.

Despite the progress made primarily through statistics, the intelligence tests in general use today are not so perfected as one would expect of precise measuring instruments. The main reason is that the extent and structure of intelligence are not as yet sufficiently well defined, while the conditions of the test situation (above all S.'s motivation) remain rather imprecise in intelligence testing as in other psychodiagnostic methods. Nevertheless, modern intelligence tests are among the most sophisticated methods available for psychological diagnosis. See *Abilities; Objective tests; Test theory; Child psychology*.

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Intensification. 1. The phenomenon that certain impressions when remembered seem greatly distorted: e.g. terrible, horrific, dangerous, amazing. Artistic representation often lays considerable stress on such distortion. **2.** Reinforcement (q.v.). H.W.

Intensity. 1. Great attention (q.v.) **2.** The state of being forced, strained or increased. **3.** The strength of, or increase of degree of, e.g. an emotion, stimulus or response.

Intention. 1. The orientation of the mind or self toward something. **2.** Goal, purpose, objective. **3.** Close attention.

Intentional psychoses. A psychiatric term which has now gone out of general use. Inhibitions or anxieties prevent the completion of certain intended actions. The cause may be psychotic (e.g. ambivalence, negativism) or neurotic (e.g. compulsion, phobia). See *Neurosis; Psychoses, functional*. C.Sch.

Intention movements (syn. *Intentional responses*). Movements which are incomplete in form, intensity or frequency and show the partner or informed observer what the animal intends to do, i.e. indicate the growing motivation of an instinct. Frequently noted in conflict (q.v.) situations. K.Fi.

Bibliography: **Heinroth, O.:** Beiträge zur Biologie, namentlich Ethologie und Psychologie der Anatiden. Verh. V. Kongr. Int. Orn. Berlin, 1911. **Tinbergen, N.:** The study of instinct. Oxford, ²1969.

Interaction. 1. A reciprocal or mutual influence between two characteristics, persons, systems, etc. **2.** In statistics (q.v.) the term *interaction* is primarily used in connection with test designs for analysis of variance. In these designs the effect of several multiple, multi-class, independent variables can be observed

simultaneously. Interaction is then a measurement of the extent to which the effect of one (or more) independent variable(s) is (are) dependent on one (or more) other independent variable(s). Interactions are sometimes more interesting than the "main effects". See *Variance, analysis of*. W.H.B.

Interaction, psychophysical. The observable reciprocal influence of physical and mental or psychological processes, e.g. the influence of emotions (q.v.) on such functions as heart and pulse rate, respiration, and so on, or the fluctuation of performance caused by fatigue (q.v.). The theory of psychophysical interaction (E. von Hartmann, W. James, H. Lotze, E. Becher), according to which body and mind can have a causative effect upon one another, seeks to explain such phenomena in postulating that the mind can precipitate physical, and the body mental, processes. As a theory it can be traced back to Descartes's separation of mind (*res cogitans*) and body (*res extensa*), and ultimately forms part of the subject-matter of philosophy (see *Mind-body problem*). As a dualistic, causal construct it does not accord with the empirically grounded conception of relations between psychological and physiological processes. See *Physiological psychology*; *Psychosomatics*. F.-C. S.

Interaction, social (syn. *Social intercourse*). The reciprocal influence of individuals or groups through the medium of communication (q.v.). The more specific term "symbolic interaction" is used when the communicative process is specially emphasized in the context of social interaction. "Social interaction" can also denote specific phenomena in social contacts, e.g. gestures, mimicry, reading another person's letter, etc. W.D.F.

Interbrain. The *diencephalon* (q.v.).

Interest. 1. Concern, advantage, good, profit.
2. A tendency to behaviors oriented toward

certain objects, activities or experience, which tendency varies in intensity (and generality) from individual to individual. Factor-analytical studies of the structure of interests have shown about fifteen independent dimensions (directions of interest), e.g. for music, politics and economics, technology and natural science, art, etc. The association between interests and personality or performance tests (with the exception of tests centering purely on knowledge) is generally slight. See *Attitude*; *Creativity*.

Bibliography: Todt, E.: *Differentieller Interessen-Test (DIT)*. Berne & Stuttgart, 1967. M.A.

Interest test (syn. *Interest inventory*; *Interest blank*). A test which measures interests or a questionnaire which elicits a range of interests. See *Kuder Preference Record*; *Strong Vocational Interest Blank*.

Interference tube. A complex sound conducting tube designed in such a way that certain components of a sound can be eliminated by a wave cancellation process, i.e. the trough of one wave being opposed to the crest of another. In this way it is possible to obtain a sound wave of increased purity. G.D.W.

Interindividual. Between different individuals. *Interindividual variability*: the variability of measured values observed in measurements on different individuals. B.H.

Intermenstrual pain. Pain occurring between successive periods of menstruation.

Intermodal qualities. Qualities of perception or imagination which are not confined to a single sensory modality. E.g. the quality "warm" is an attribute not only of sensed temperature but of visual and auditory perception; we speak of a "warm" color and of a "warm" voice. P.T.

Internalization. The adoption of attitudes, norms, prejudices, etc., by an individual.

Internal secretion. The release of glandular products directly into the bloodstream from glands without an outlet channel. The products are hormones (q.v.), which influence growth, development and metabolic (hormonal control) as well as psychological processes. *F.-C.S.*

Interoceptor. See *Enteroceptor*.

Interpretation. An activity as a result of which a physical or psychological datum is related to a conceptual model which assigns place and significance to the datum. *F.B.*

Interquartile range. The interquartile range takes as its "positional parameters" the measured values in a distribution between which the middle 50% of all observed cases are located. The interquartile range is therefore the interval between the first (25%) and third (75%) quartile. *W.H.B.*

Interrogation of suspects. In its psychological aspects, the examination of suspects forms part of forensic psychology (q.v.). The methods of psychology are used in an attempt to determine the subjective accuracy of verbal evidence. The methods used may be divided into two classes: (a) Association tests (q.v.) and other verbal reaction methods. In most cases the reaction time and word are evaluated diagnostically. These techniques were used even in the early stages of work in this area, by C. G. Jung (q.v.) and M. Wertheimer (q.v.). (b) Methods for recording physical side-effects during interrogation. Such techniques usually consist of questioning the suspect with a mixture of directly relevant

and irrelevant questions, and of registering simultaneous physical symptoms. This latter aspect can, of course, be restricted to a mere intuitive interpretation of expressions (see *Expression*), but objective techniques for measuring physical symptoms (e.g. measurement of pulse, respiration, skin resistance, muscular activity; see *Polygraph*; *Lie detector*) are more sensitive. The relation between the measured physiological processes and simultaneous psychological processes allows the tester to assume a correlation between measurements and the accuracy or inaccuracy of a statement. The legal acceptability of such findings varies from country to country. See *Credibility*; *Criminality*; *Objective tests*.

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Interrupted action. See *Zeigarnik effect*.

Intersexuality. The condition of being intermediate between the two sexes, especially with respect to the secondary sex characteristics (see *Hermaphroditism*).

Intersex: Abnormal individual intermediate between male and female, that has identical genetic form throughout all its cells (see *Gynandromorph*). *G.D.W.*

Interstitial cell stimulating hormone. See *ICSH*.

Intersubjectivity. 1. In E. Husserl's phenomenology (q.v.): the association of subjectivities which is necessary for an objective

world to exist. 2. Subjective experience (e.g. perception) becomes intersubjectivity when several individuals experience the same thing, e.g. report the same experience, or experimental results. *B.H.*

Interval. 1. The range of time between two events, etc. 2. The distance between two assignable points or values. 3. The difference in pitch between any two tones (notes). 4. Remission of a disorder (e.g. delirium).

Interval estimate (syn. *Interval rating*). In an interval estimate two values are indicated on the basis of samples; a given parameter is situated with a known probability between these two values. An interval estimate indicates the fiducial interval (see *Limits, fiducial*) to be taken into account when a statistical index is substituted for an (unknown) parameter. It is therefore a measure of the accuracy of a sample. See *Statistics*. *W.H.B.*

Interval of uncertainty (abb. *IU*). The range of stimuli between thresholds obtained using different methods, especially ascending and descending series in the *limits method* (q.v.).

G.D.W.

Interval scale. A unit of measurement whose multiple represents the interval magnitude is necessary to quantify an interval (defined as the distance between two values). Unlike ordinal scales, interval scales have identical distances between the scale units, but no genuine (i.e. absolute) zero point. *W.H.B.*

Intervariation characterizes the extent of differences in measured values between individuals. The opposite is the case with *intra-variation*, i.e. the variability of measured values in a given individual during repeated observations. With the increasing application

of statistical methods in psychology, these terms have tended to disappear from the literature. The modern equivalents represent standards of statistical variability. For the diagnosis of individual cases, *ipsative* (deviation from average value for a single person) or *normative* (deviation of one person from the average for a sample) values take over this function. *W.H.B.*

Intervening variable. A hypothetical variable and not a statistical concept, the intervening variable cannot be observed directly even though an operational definition can be given of its effect; it has an "intervening" function in the stimulus-response process, and may be considered as the *expression of a relationship* between stimulating conditions and responses (the dependent variable). *W.H.B.*

Interview. The most important of the various techniques of data collection is questioning or interviewing; a prominent factor is the use of language as a means of communication (which, of course, creates certain problems). In general, the interview is a means of obtaining verbal (and written) information. Despite the use of early, crude techniques of questioning (e.g. by ethnologists, cultural anthropologists, sociologists and psychologists), the systematic development of the interview into a research instrument and a methodically controlled observation technique occurred only in the early years of the present century. The appearance of market and public opinion research (q.v.) in the USA was followed by the gradual development of sociological research (see *Attitude; Social psychology*) dependent on planned questioning—especially for checking hypotheses. Psychology and psychoanalysis (q.v.) also use interviews in conjunction with observation, tests, experiments, etc., to obtain statements from subjects which will enable conclusions to be drawn about attitudes, actions, circumstances, conflicts, self-interpretations of a

person's position in life, etc. In this sense, the interview is a planned procedure with a scientific objective, in which verbal information is elicited from testees by means of a series of deliberate questions or communicated stimuli; it can be a means (in diverse practical fields) of elucidating the situation of entire populations, or groups within a population, or merely the condition (in a wide sense) of an individual patient.

The standardized interview is the technique most often used when dealing with single persons. It allows the greatest degree of comparison. The wording, sequence of questions, possible answers, and *interviewer's behavior* are fixed in advance. Only the standardized questionnaire supplies *fully comparable data*. However, comprehensive knowledge about the subject under review is assumed. More important than the identical wording of the questions is that they should mean the same thing to all the testees. This can be achieved by standardizing the meaning in the partly standardized interview, or by "filter" questions which eliminate Ss. who do not seem to be suitable for a certain range of questions.

In the semi-standardized interview a series of questions is used which enables the interviewer to react at certain points, and to conduct a comparatively free exploration by changing the wording and explaining the questions, omitting or adding others and continuing the questioning. Such interviews (structured or semi-structured interviews, and formal questionnaires or inventories) have a detailed plan; in contrast, the *depth interview* (unstructured, open, exploratory, intensive or qualitative) leaves the shaping and development of the questioning in large measure to the discretion of the interviewer, who works to a general plan consisting especially of interview objectives, some groups of subjects, and possibly *ad hoc* questions. This type of interview is more like a free but guided conversation, with or without written note-taking or tape recording. It is suitable in various psychological disciplines, especially

for obtaining a more complete account of individual cases (flexibility and more comprehensive information—more difficult quantitative evaluation).

Sets of data obtained by unstructured and intensive questioning are not comparable since standardization of significance during the course of the interview is impossible. In contrast to the form of the personal interview, the written interview consists usually of standardized questionnaires which are sent out to the testees (these may be useful in collecting more objective data, but there is not sufficient checking and possibly few replies may be received). *Group interviews* are also carried out in a written or personal form, in natural or experimental groups.

Questions vary very widely in form. The closed question allows the interviewee to give only set answers: in the alternative question these are Yes or No, in the choice question there are several possibilities to be selected from a list which is either printed or read out. The open question, on the other hand, allows free answers; other "half-open", questions allow for answers which are not prescribed but nevertheless admissible. The direct question makes the meaning and purpose of the question clear from the start; the indirect question, sometimes in conjunction with projective techniques (q.v.), conceals the orientation in order to exclude wrong and/or socially standardized answers. Batteries of questions, i.e. a number of individual questions, are useful in an optimally comprehensive investigation of a thematic complex separated from other themes by introductory and bridging questions. Follow-up questions complete the picture; filter questions are used to find out which main questions do not apply to a particular testee; control questions enable answers to be checked.

The interviewer's behavior can have considerable influence on the interview and its results. In the neutral interview the interviewer must adhere strictly to his instructions, and refrain from giving any help or

making any comment. On the other hand, the interviewer has to play an active part in the "hard" interview (a "cross-examination"), or the "soft" interview (in which an atmosphere of confidence is created). In both cases the object is to get the testee to give the right answers, to prevent evasion, to detect contradictions, etc. Even an adequate training in interviewing will certainly not prevent any negative influence due to prejudice, to influencing the test subject by showing agreement, to the way in which answers are received, the interviewee classified and his responses written down. The following are some of the points which need watching in the interviewee: readiness, fluctuations of mood, alertness, education and training, expressiveness, knowledge, retention, social class, taboo subjects, evaluation of self and intimate environment, and attitude to the role of the interviewer as a stranger. How much anyone will be prepared to disclose varies considerably according to culture, class, club and other social groups. Special problems arise in depth interviews (e.g. in clinical interviewing). In research, such methods are used mainly for pilot studies (q.v.).

Reliability is the degree of consistency with which a result is obtained when the same technique is repeated. With regard to the reliability of interview data, results are available which show a value of 90% for personal interviews in the form of repeated questionings of the same persons—the panel method. The degree of reliability depends on the time lapse between the two interrogations, the groups interrogated and the subjects inquired into. There is more stability when the questions deal with more subjective matters, whereas opinions and attitudes (q.v.) are subject to varying degrees of fluctuation. Validity depends on whether the results obtained by the use of a certain technique really represent what is supposed in the interpretation. As regards the validity of interview data, only isolated material has so far been published and no comprehensive study of the subject is available. Validity

may be verified by, say, comparison of the results of a questionnaire with official figures (e.g. in regard to elections and statistics of electoral behavior). The validity of interview data is no higher than their reliability; on the other hand, a high degree of reliability does not necessarily indicate an equivalent degree of validity. See *Questionnaires; Intelligence tests; Objective tests*.

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A. Bellebaum

Interviewer bias. An intruding variable to be taken into account when evaluating an interview: the effects of the interviewer's attitudes and prejudices.

Interviews, drugs in. Certain psychotropic substances with a beneficial influence on verbal behavior are used in interrogations or interviews. Hypnotic drugs, tranquilizers, antidepressants, stimulants, and hallucinogens or psychotomimetic drugs are used both for diagnostic-therapeutic purposes and also to obtain important information from potential sources. These substances may make an interrogation more productive by inducing (in various ways) some weakening of the resistance of a potential informant. Nevertheless, the validity and accuracy of the knowledge obtained are doubtful and can be confirmed only by extrinsic criteria. Not to give information does not signify that the person interrogated is not in possession of it. Facts disclosed under the influence of such drugs are usually not admissible as evidence in a court of law.

Bibliography: Gottschalk, L. A.: *The use of drugs in information-seeking interviews*. In: Uhr, L. & Miller,

J. G. (Eds.): *Drugs and behavior*. London, 1960; New York, 1964. *E.L.*

Intimacy. 1. Coitus (q.v.). 2. In gestalt psychology (usually "intimacy principle"): the interdependence of the "parts" of a gestalt, none of which may be removed or added to without changing the whole, and therefore all other parts. See *Ganzheit*.

Intimate sphere. A pre-scientific term for areas of private behavior supposedly withdrawn from social influence. *J.F.*

Intolerance. See *Tolerance*; *Authoritarian personality*; *Prejudice*.

Intonation. Speech melody: aspects of pitch (q.v.) in speech.

Intoxication. 1. Poisoning. 2. A temporary psychological condition resulting from poison or drugs (especially ethyl alcohol) and manifested in a variety of behaviors and symptoms ranging from exhilaration and loss of personal and social responsibility to depression, stupor or coma. See *Alcoholism*; *Drug dependence* (as chronic states). 3. Usage is sometimes extended metaphorically to include similar behavioral effects of purely psychological origin, e.g. "intoxicated with joy".

Intoxicant: An agent producing the state of intoxication. *G.D.W.*

Intraindividual. Within an individual. *Intraindividual fluctuations:* fluctuations of values (e.g. body temperature) observed during repeated measurements of a particular characteristic in a given individual. *B.H.*

Intramural nervous system. A term sometimes used to describe the majority of the nerve

fibers and ganglionic cells in the various layers of the intestinal wall. The most important are the *plexus myentericus* (L. Auerbach), between the intestinal musculature, and the *plexus submucosus* (G. Meissner) below the mucous membrane layer. The intramural nervous system forms part of the autonomic nervous system (q.v.) and regulates intestinal movement and secretion. The blood vessel walls also contain elements of the autonomic nervous system which affect the smooth musculature of the vessels, and thus regulate the hemodynamically effective cross-section as well as tonus.

Bibliography: Leonhardt, H.: *Histologie und Zytologie des Menschen*. Stuttgart, 1969. *G.A.*

Intrapsychic. Within the mind (endopsychic, q.v.), or the self as a whole.

Intrinsic. That which is inward, fixed in the nature of the person or thing, and therefore not dependent on external influences or accident. Ant. *extrinsic*: that which is outward and does not belong to the essential nature of the person or thing.

Intrinsic-extrinsic. A distinction of H. Heckhausen's in regard to two components of *learning motivation*. *Intrinsic motivation* consists of achievement motivation (q.v.); stimuli from a specialism; task stimuli (related to the degree of difficulty of the task); attainability (calculation of the probable success in performing a task); and the degree of novelty possessed by a thing or task, or attributable to it. All other motivations are extrinsic, i.e. come from without, and are posited, not with the thing or task, but by the teacher, his personality, his style of teaching, and his sanctions. Extrinsic stimuli, rewards and punishments are thought to be less effective in the long run than those deemed intrinsic.

M.H.

Introception. The inclusion of social standards (e.g. customs, conventions, ideals) in the individual's own system of motivation; introception is not identical with socialization, where conformity (especially in behavior) is not necessarily emphasized in the dynamic structure. B.H.

Introjection. 1. The term is generally used with the same meaning as identification (q.v.): an individual's incorporation into his ego of an object-image representing the object as he thinks it is. The most primitive form of introjection is "oral incorporation" which is alleged to consist of fantasized incorporation of the primary love-object (the mother) by the child when in a state of oral frustration; according to Freud, Abraham and Fenichel, this is a significant factor in psychotic depression.

2. The epistemological theory that the conscious mind apprehends the external world (only) by means of (the) images (the mind generates).

Bibliography: Abraham, K.: Selected papers on psychoanalysis. London, 1927. Fenichel, O.: The psychoanalytic theory of neurosis. New York, 1945. Freud, S.: Collected papers, Vol. 4. London, 1924-5. W.T.

Intromission-copulation-ejaculation mechanism. A concept which occurs in comparative psychology (q.v.) and sex research. The two- or three-mechanism theory attempts to explain sexual behavior patterns in the male animal, and draws on the results of experiments in mammals (mice, rats, hamsters, guinea pigs). It is suggested that at least two or three mechanisms are involved in male sexual behavior: (a) an *arousal mechanism* (AM), which leads to sexual excitement, followed by erection and copulation; (b) a *copulatory mechanism* (CM), which is activated by the first intromission (introduction) of the penis, and leads to repeated intromission which maintains the

full excitement of the CM until the critical threshold of ejaculation is reached (Beach *et al.*, 1956, 1959); (c) the *ejaculatory mechanism*, which is triggered by ejaculation (neurologically: the "ejaculation reflex") and prevents sexual excitement (by inhibiting the AM) until a certain recovery of "drive" has taken place (McGill, 1965). AM, CM and EM, defined by certain behavioral characteristics and duration times, vary not only from one species of animal to another but (as a function of the genotype) within a given species. For a critical summary, see Bolles (1967).

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Introspection. Self-observation. The contemplation of one's own experiences; sometimes, though not necessarily, implying a morbid preoccupation with one's inner thoughts and feelings. In *structural psychology*, the reporting of thought processes and sensations (either during—*simultaneous introspection*—or immediately after—*retrospective introspection*—the process) as a technique for generating psychological data. *Beschreibung* (Ger.): such reporting of the direct experience of the individual. G.D.W.

Introspective psychology. A branch of psychology which uses introspection (q.v.) as a preferred method for obtaining data. The basic assumption is that subjective elements are objectified (see *Phenomenology*). In its theoretical and experimental aspects, the school has developed several different models, e.g. for processes of the will (see *Kölpe*).

B.H.

Introversion. Jung (1971) maintained that mental or psychic energy (libido) may be directed outward (extraversion) or inward (introversion). Hence there are two opposed reaction types determining the nature of behavior, subjective experience, and even compensation by the unconscious. Introversion (like extraversion) is rooted (according to Jung) in the biological constitution of the individual and is therefore difficult to alter. The definition of an individual as introverted or extraverted may be considered as remaining constant throughout his life. See *Traits; Type*.

Bibliography: Jung, C. G.: Psychological types (Collected Works, Vol. 6). London & New York, 1971. W.S.

Introversive type. An individual who in the Rorschach test shows a "predominance of introverted behavior, intensive relationships, stabilized affectivity and motility, inadequate adaptability to reality, and inadequate extensive relationships." Partly identical with the introvert. W.K.

Introvert (syn. *Introverted type*). A character type defined by Jung, and having a deficient or negative relationship between the ego and object as its main feature. Tendency to distance and depth. An individual in whom "a subjective attitude is inserted between perception of the object and his own behavior which prevents behavior from assuming a character corresponding to the given objective structure." Introverts "if normal, are characterized by a hesitant, reflective, withdrawn nature; they are reserved, frightened by objects, always on the defensive and likely to hide behind mistrustful observation"; they are therefore not very adaptable. Eysenck also defines the introvert as the opposite of the extravert, but as a statistically determined personality factor (see *Type*).

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Intuition. A mode of operation of intelligence (q.v.) and its product. As a mode of operation, intuition denotes a form of direct cognition characterized by its direct and sudden nature. It is based on spontaneous internal organization, on a perception, or on an idea or image. Intuition as "sympathy" with the object (H. Bergson) may amount to non-conceptual cognition, but may also be a rapid analytical understanding of a reference system whose actual analysis would require long discursive development (E. Brunswik). Intuition is concerned with an externally (empirical) or internally (metaphysical) perceptible phenomenon. In every case the existential nature of the object is apprehended by the mind. M.J.B.

Intuitive type. A functional type in whom the "basic function" of intuition dominates, and judgment is only secondary. As an extravert, the intuitive type constantly seeks new possibilities and is guided by confidence in his perception. As an introvert, however, the intuitive type appears as an "imaginative, artistic person" or as a "dreamer and visionary", internal perception being directed to the esthetic or moral sphere. W.K.

Intuitive understanding, psychology of. See *Verstehende Psychologie*.

Invariance. A parameter or trait is said to be invariant in relation to a transformation if it remains unchanged on application of the latter. E.g. the length of a rod is an invariant factor when it is rotated in space. K.-D.G.

Invariance, problem of. Any problem associated with the constancy, i.e. independence, of stimuli in regard to changes in external conditions. Invariance is dealt with under terms such as "generalization of learning",

"concept formation", "constancy of perception". E.g. constancy of perception is the easiest type of invariance to examine. The resulting perceptual content is independent of all changes brought about by interference. A distinction is made between: color constancy, brightness constancy, gestalt constancy, size constancy, and direction and movement constancy. *H.W.*

Inventories. See *Questionnaires*.

Inversion. A reversal of poles, e.g. top to bottom, right to left, e.g. inversion of the retinal image. In mathematics, a transform which achieves reversal of a variable or matrix. *G.D.W.*

Inversion, sexual. Assumption of the characteristics and role of the opposite sex, e.g. *transves(tit)ism* (q.v.). Has also been loosely used as a synonym for *homosexuality* (q.v.) (especially in psychoanalysis), and even *hermaphroditism* (q.v.). *Invert:* An individual with homosexual inclinations. *G.D.W.*

Inverted figures. See *Reversibility*.

Involution. On reaching maturity, the psychological development of man continues at a slower rate, and finally enters a phase of involution. At the climacteric (about the age of forty-eight), biological involution sets in as a transition to a way of life in which mental activity is more highly emphasized. Old age is a further period of involution. See *Aging; Gerontology*. *M.Sa.*

IPAT Anxiety Scale. The Ipat (Institute for Personality and Ability Testing) Anxiety Scale was developed by Cattell and Scheier on the basis of factor-analytical principles (1957). The subjective questionnaire com-

prises forty items which represent the secondary factor "anxiety"; anxiety, in turn, consists of five primary factors. The test-retest reliability is between $r = 0.87$ and 0.93 (1-2 weeks) and the split-half reliability between $r = 0.84$ and 0.91 . The construct validity (q.v.) of the items is $r = 0.92$, and that of the primary factors $r = 0.85$. The criterion validity (correlations with other anxiety tests) is between $r = 0.72/0.85$.

Bibliography: Cattell, R. B. & Scheier, I. H.: Handbook for the IPAT Anxiety Scale. Champaign, Ill., 1957; ²1963. *P.G.*

IPAT (O-A) Anxiety Battery. The Objective-Analytic (O-A) Anxiety Battery was designed by Cattell and Scheier (1960) on the basis of factor-analytical principles. The objective questionnaire with its two hundred and sixty-two items represents the primary factor "anxiety", and measures mainly the trait anxiety. The split-half reliability of the verbal subtests is between $r = 0.56$ and 0.90 (average: $r = 0.75$). The construct validity (q.v.) of the overall battery is indicated by Cattell as $r = 0.94$. The criterion validity (other anxiety tests) is greater than 0.80 .

Bibliography: Cattell, R. B. & Scheier, I. H.: Handbook for the A-O Anxiety Battery. Champaign, Ill., 1960. *P.G.*

IPAT Objective-Analytic (O-A) Personality Test Batteries. The representative test battery in factor-analytical personality research, with objective tests by Cattell. The version for adults measures fourteen objective personality factors, with fifty-six objective tests (q.v.) (for children: eight [six to ten years], or eleven [eleven to twelve years] personality factors). Reliability coefficients are not given in the manual. The factor loadings are described by Hundleby, Pawlik & Cattell (1965). In the present state of development, the test is primarily a research instrument.

Bibliography: Cattell, R. B. *et al.*: Handbook for the O-A. Personality Test Batteries, Champaign, Ill.,

1955. Hundleby, J. D., Pawlik, K. & Cattell, R. B.: Personality factors in objective test devices. Champaign, Ill., 1965, 339-406. P.G.

Ipsation (syn. *Ipsism*). Masturbation (q.v.) or autoeroticism with reference to some particular part of the body, e.g. anal ipsation, mammary ipsation, and so on. G.D.W.

IQ. Abb. for *Intelligence quotient* (q.v.).

Iris. An opaque regulable diaphragm in the form of an 0.5 mm thick disk of connective tissue with a variable internal diameter, separating the anterior from the posterior chamber of the eye (see *Eye*; *Sense organs*). The iris is continuous peripherally with the ciliary body; its aperture is the contractile pupil, whose width can be varied between about 8 and 2 mm by the smooth *sphincter pupillae* (sphincter) and *dilatator pupillae* (dilator) muscles located in the iris. The pigmentation of its posterior pigmented surface is wholly absent in the condition of albinism. The anterior colored surface represents the "color of a person's eyes". K.H.P.

IRM. Abb for *Innate releasing mechanism* (q.v.).

Irradiation. 1. The influence exerted by one field on another. 2. Physiologically: the extension of stimuli in certain regions of the brain to neighboring areas of the CNS. 3. Psychologically, and in the sense of an optical illusion: bright objects on a dark background appear larger than dark objects of the same size on a bright background. According to T. Ziehen, irradiation occurs when neutral conscious material is influenced by emotional experiences which are present at the same time or have some associative connection with it. K.E.P.

Irrational. Any assertion based not on the laws of reason but on intuition is irrational, as are theories regarding an object (life, existence, will, etc.) outside reality. This is particularly true of Freud (in his late phase). M.R.

Irrelevant actions (syn. *Comfort movements*). Inappropriate behaviors such as stretching, yawning, scratching one's head, preening (see *Allopreening*). Although these "occur easily" (e.g. insects cleaning their antennae), by no means all such movements are autochthonous; in conflicts they often tend to be displacement activities (q.v.). As derived and ritualized movements they play a great part in the evolution of displays.

Bibliography: Bilz, R.: Zur Psychophysik des Verlegenheitskratzens. Zentralbl. Psychother. u. Grenzgeb., 1941, 13, 36-50. Tembrock, G.: Verhaltensforschung. Jena, 1964. K.Fi.

Irresponsibility. See *Guilt*.

Irritability. 1. Stimulability; excitability; the characteristic property of living matter to respond to stimuli by movement, etc. 2. Contractability of a muscle. 3. Affective response; emotional changeability; oversensitivity to stimulation: a strongly emotional response is given to normally acceptable stimuli. See *Arousal*; *Emotion*. H.W.

Irritation. 1. The effect of stimuli. 2. Inflammation.

Ishihara test (syn. *Ishihara chart*; *Ishihara color plate*). A test for color blindness: figures are printed in varying hues against backgrounds of varying saturations and brightness. The color-blind or color-defective individual does not see the figure, or sees it imperfectly.

Island of Reil. See *Insula*.

Isolation. A hypothetical internal defense (q.v.) mechanism in which a motive which can no longer be satisfied or is forbidden can only be "abandoned" by partially satisfying it in thought or symbolically, and is therefore experienced as alien to the individual. The unsuccessful attempt at repression is reinforced by repression (q.v.) of the connection between the questionable motive and the individual. Isolation is said to occur frequently in compulsion neuroses. *W.T.*

Isolation of variables. In experiments: the intentional alteration of a condition (independent variation) in order to observe a dependent variable, while all other conditions are kept "constant", or are not altered systematically. The effect of individual conditions which are otherwise closely bound up with the phenomenon or process can then be observed in isolation. *W.H.B.*

Isolation, social. Minimal social contact or maximum social distance between individuals and/or groups. The aftereffects of social isolation in the early years of life have been described in particular by Harlow (1958) and Spitz (1958) as hospitalism (q.v.). Voluntary or planned isolation of one group in relation to

alien groups is frequently used as a means of heightening the internal cohesion of the isolated group. See *Group dynamics*.

Bibliography: Harlow, H. F.: The nature of love, *Amer. Psychol.*, 1958, 13, 573-685. Spitz, R. A.: Hospitalism: an enquiry into the genesis of psychiatric conditions in early childhood. New York, 1958.

A.S.M.

Isomorphism. The theory of *isomorphy*, or correspondence of gestalts: i.e. between what is experienced perceptually and the central-physiological correlate. It is assumed that the physiological processes correspond, not in their geometrical forms, but in their dynamic structures, with the contents of experience. See *Ganzheit*; *Psychophysics*. *P.T.*

Item. A single exercise in a test. See *Objective tests*; *Test theory*.

Item analysis. The various processes used to select items for tests. See *Test theory*.

Iteration tests. Statistical test methods for checking the randomness of a sample selection.

Ixothymia. A viscous temperament (q.v.).

J

Jackson's law. After John Hughlings Jackson, English neurologist (1834–1911). The generalization that when intellectual functions are lost through disease of the nervous system, those which appeared latest in evolution are the first to disappear, that is deterioration retraces evolution in reverse. The phylogenetically developing, “stratified” structure of the CNS corresponds to a distribution of functions in the sense that the higher systems always exercise an inhibiting influence on the lower ones. The function of the higher, phylogenetically younger centers is more labile than that of the deeper, older centers. In brain damage the mental and intellectual functions (orientation, perceptual ability, memory and thought) are the most sensitive and most easily injured, and are the first to be impaired or lost. *G.D.W. & C.S.*

James-Lange theory of emotion. A theory concerned with the relationship between the physiological changes that occur with emotional arousal (q.v.) and the accompanying experience of the emotion (q.v.). The Danish philosopher C. G. Lange had argued that emotion is identical with changes in the circulatory system. The American psychologist William James (q.v.) elaborated this theory, arguing that the emotional experience results from the perception of the various bodily changes that occur in response to emotive stimuli. Thus he held that the bodily changes are neither the outcome nor the concomitants of the emotional experience, but its *cause*. It would therefore be more true to say that we

are afraid because we run away, than that we run because we are afraid.

Bibliography: Lange, C. G. & James, W.: *The emotions* (Ed. Dunlap, K.). Baltimore, 1922. *G.D.W.*

James, William. B. 1/11/1842 in New York City; d. 16/8/1910 at Mount Chocorua, New Hampshire. In 1861 James enrolled at Harvard University in the Lawrence Scientific School. He first studied chemistry, then comparative anatomy, biology and physiology, and entered the Harvard Medical School in 1864. His interest in psychology was heightened by a visit to Germany in 1867–8. In Berlin he attended lectures by Du Bois-Reymond, the famous physiologist, and in Heidelberg courses given by Helmholtz and Wundt. His academic career continued at Harvard: M.D. in 1869, Instructor, 1872, and Assistant Professor of physiology in 1876, Assistant Professor of philosophy in 1880, and then Professor of philosophy in 1885; in 1889, Professor of psychology, and Professor of philosophy again from 1897 to 1907. He set up one of the first psychological laboratories in the world, in 1875. His main psychological study, *Principles of Psychology* (1890), is one of the basic works of modern psychology. James was a pioneer of American psychology and is sometimes compared with Wundt. He was a co-founder of the functionalist movement and a supporter of evolutionism; he was a friend of C. Stumpf and worked with H. Münsterberg. He was an independent thinker and not a proponent of systems or a laboratory psychologist

but a man of many ideas and an intelligent critic who remained close to reality; his style was highly original. In his psychology of emotion (q.v.) and expression he represented an extreme type of physiologism but was nevertheless on the way to "a phenomenological psychology" (J. Linschoten); he advocated an experimental psychology which he did not himself practice; he stood for "radical empiricism" and also developed a pragmatic religious philosophy and psychology. Among his contributions to psychology, his theory of consciousness (q.v.) and the self (see *Ego*) deserve especial mention. James saw consciousness as a result of adaptation helping man toward species- and self-preservation. As regards the self, he made a distinction (still discussed) between the "discriminated aspects and not separate things" of "I" (the self as knower) and the social "Me" (the self as known: material, social and spiritual). He represented consciousness ("stream of consciousness") as processual rather than static (structured), and emphasized the dynamic nature of human psychology. "Consciousness, as a process in time, offers the paradoxes which have been found in all continuous change. There are no 'states' in such a thing, any more than there are facets in a circle. . . . Yet how can we do without 'states', in describing what the vehicles of our knowledge seem to be?"

Main works: Principles of psychology. New York, 1890; London, 1891. Text-book of psychology. New York & London, 1892. The will to believe. London, 1897. Human immortality. Boston & London, 1898; ²1917. Talks to teachers on psychology, and to students on some of life's ideals. New York & London, 1899. The varieties of religious experience: a study in human nature. London, 1902. Pragmatism, London, 1897. The meaning of truth. London, 1909. A pluralistic universe. London, 1909. Some problems of philosophy. London, 1911. Essays in radical empiricism. London, 1912.

Bibliography: Allport, G. W.: The productive para-

doxes of William James. Psychol. Rev., 1943, 50, 95-120. *Id.*: William James and the behavioral sciences. J. Hist. beh. Sci., 1966, 2, 145-7. Boring, E. G.: Human nature vs. sensation: William James and the psychology of the present. Amer. J. Psychol., 1942, 55, 310-27. Harper, R. S.: The laboratory of William James. Harvard Alum. Bull., 1949, 52, 169-73. Knight, M.: William James. London, ²1954. Linschoten, J.: Auf dem Wege zu einer phänomenologischen Psychologie: die Psychologie von W. James. Berlin, 1961. Perry, R. B.: The thought and character of William James, 2 vols. Boston & London, 1935.

L.J.P.

Janet, Pierre. B. 29/5/1859, in Paris; d. 24/2/1947, in Paris. Studied philosophy and medicine at the University of Paris; in 1889 he gained his doctorate for philosophy with a thesis on the psychology of automatic activities; in 1890 Charcot appointed him Director of the psychological laboratory at the Salpêtrière hospital. In 1892 he received his doctorate in medicine with a thesis on the mental state of hysterics, in which he attempted a systematic classification of the different forms of hysteria, and tried to establish a concordance between hysterical symptoms and psychological theories; he taught at the Sorbonne from 1895 to 1902 and then replaced Ribot in the chair of psychology at the Collège de France, where he remained until his retirement in 1936. In 1904 Janet and G. Dumas founded the *Journal de psychologie normale et pathologique*, which Janet edited until 1937.

Janet's "psychologie de la conduite". In his behavioral theory, Janet works from the assumption that a scientific study of psychology can be meaningful only if all mental processes are interpreted as behaviors. He was one of the first to place special emphasis on the dynamic characteristics and unity of psychological phenomena. Although he had much in common with Freud (q.v.), their relationship was strained, partly because Janet claimed that Freud's psychoanalysis (q.v.) was based on his own work and that of Charcot. Janet conceived personality as a totality of tendencies which he arranged in a

hierarchy on the basis of their phylogenetic and ontogenetic origins (strata theory), from the lower (reflex actions, etc.) to the higher tendencies (rational, etc.). By "tendency", Janet understood a disposition of the organism to complete a specific action; he included both external and internal or secondary actions (e.g. emotions) under the notion of action. A human being generally has access to tendencies which correspond to all the diverse stages and are normally present in a latent form. All these tendencies have specific energy loadings, which Janet derived from hereditary, physiological and psychological processes, and whose activation is manifested in behavior (actions). The lower tendencies generally have higher energy charges than the higher tendencies; they are also easy to arouse, and discharge more completely than the higher tendencies, which are only discharged successively (in this context Janet, like Freud, allows for the possibility of the inhibition and transference of instinctive [drive] energies). In general, the overall behavior of a given individual corresponds to a certain hierarchical level ("psychological or mental tension") determined both by the rank order of behaviors in the hierarchy of tendencies and by the degree of activation of those behaviors. An individual's mental tension is high if he can easily perform, frequently and accurately, actions with a high ranking in the hierarchy. The tension level is not constant but subject to continuous fluctuation. Janet emphasizes the degree of reduction of mental tension as the criterion for a classification of personality disorders. Reductions in tension which relate only to the stage of the highest tendencies are still normal; if mental tension drops below the stage of considered behavior (medium tendencies), Janet speaks of *neuroses*. If the tension falls to the level of elementary intellectual behavior, he speaks of *psychoses*; and if it drops to the level of perception and reflex actions, organic disorders of the CNS are in question.

Main works: *L'automatisme*. Paris, 1889.
L'état mental des hystériques. Paris, 1892

(Eng. trans. The major symptoms of hysteria. New York, ²1920; facsimile ed., N.Y., 1965).
Les obsessions et la psychasthénie. Paris, 1903.
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Les névroses. Paris, 1909.
De l'angoisse à l'extase. Paris, 1926.
Psychological healing: a historical and clinical study, 2 vols. London, 1925.
Psychological analysis. In: Murchison, C. (Ed.): *Psychologies of 1930*. Worcester, 1930, 369–73.
Pierre Janet. In: Murchison, C. (Ed.): *History of psychology in autobiography*, Vol. 1. Worcester, 1930, 123–33.

Bibliography: Mayo, E.: Some notes on the psychology of Pierre Janet. Cambridge, Mass., 1948.
 Zilboorg, G. & Henry, G. W.: *A history of medical psychology*. New York, 1941. W.W.

J curve. A hypothesis put forward by F. H. Allport (1934) according to which the frequency of the behavioral characteristics of a group exposed to pressure to conform—unlike groups without such pressure—follows a J distribution rather than a standard distribution (e.g. punctuality of workers in a company with fixed working hours as opposed to punctuality in a company in which the starting time may vary; or varied behavior at traffic lights). The curve of varying degrees of conformity often approximates an inverted capital J.

Bibliography: Allport, F. H.: The J-curve hypothesis of conforming behavior. *J. soc. Psychol.*, 1934, 5.
A.S.-M.

Jargon. 1. Incomprehensible speech. 2. Language, vocabulary or style specific to a particular profession, political party, branch of learning, etc.

Jastrow's illusion. One of the geometric illusions. Although they are identical in size



the lower of the two curved figures appears larger. *C.D.F.*

Job. 1. A task. **2.** An occupational activity performed in return for (a monetary) reward.

Job analysis. A detailed study of all the requirements and conditions of a particular occupation. Often used in management training and the preparation of interview programs. See *Industrial psychology*.

Job enlargement. Adding to an occupational activity by the inclusion of new operations (previously performed by others) in order to make the work more interesting, rational and/or responsible. *G.R.W.M.*

Job rotation. A planned change in activities and/or functions for training and vocational advancement of executives. *G.R.W.M.*

Jost's law(s). **1.** The older of two associations of identical intensity diminishes less with the the passage of time. **2.** Practice is of greater benefit to the older of two associations of identical intensity. See *Association*.

Bibliography: Jost, A.: Die Assoziationsfestigkeit in ihrer Abhängigkeit von der Verteilung der Wiederholungen. *Z. Psychol.*, 1897, 14, 436-72. *H.H.*

Judgment. 1. The power or process of discerning the relations between one object, or concept, or term, or proposition, and another; or a propositional statement of those relations. See *Logical reasoning*; *Perception*; *Thinking*. **2.** A critical evaluation. **3.** The discernment of stimuli and their intensities (see *Psychophysics*).

Bibliography: Abercrombie, M. L. J.: The anatomy of judgment. London, 1960. Bruner, J. S., Goodnow, J. J. & Austin, G. A.: A study of thinking. New York, 1962.

Judgment, change of. A process of social suggestion or influence in which relatively simple verbal or symbolic "more or less" decisions on specific objects (e.g. perceptual objects) are altered: for instance, such basic judgments as "long" or "short", "positive" or "negative", "sympathetic" or "unsympathetic". A term sometimes used to characterize changes of opinion or attitude where there is no conceptual qualification beyond the basic term. See *Psychophysics*. *H.D.S*

Judicious learning. See *Learning, mechanical*.

Jung, Carl Gustav. B. 26/7/1875 in Kesswil (Switzerland); d. 6/6/1961 in Küsnacht. After obtaining his medical degree from the University of Basle in 1900, Jung was appointed assistant, and later lecturer, under Eugen Bleuler at Zürich. He gave up his university post in 1913 in order to devote himself to private practice and to research. From 1906 he corresponded regularly with Freud, whom he met for the first time in 1907, in Vienna. This was the beginning of a short-lived friendship, during which Freud for a time saw Jung as his successor. In 1909 they traveled together to Worcester, USA. In 1907 Jung founded the Freud-Gesellschaft in Zürich. In 1908 he organized the first International Psychoanalytic Congress in Salzburg. In 1911, with Freud's support, Jung was elected first president of the International Psychoanalytic Society; soon afterwards, the difficulties in his relations with Freud (primarily arising from Jung's rejection of the libido theory) increased. Their correspondence ceased in 1913; and in 1914 Jung resigned his presidency (and later his membership) of the International Psychoanalytic Society. Between 1921 and 1926 he made field expeditions to study primitive cultures in Arizona, Mexico, North Africa, and Kenya, and pursued his interest in mythology, alchemy, religion, occult practices, and so on. From 1933 to 1942 he was Professor at the Zürich

Polytechnic; and in 1944 he was appointed Professor of medical psychology at the University of Basle.

In contradistinction to Freud's more natural-scientific, mechanistic theory of personality, Jung's analytical conception of personality represents an attempt to interpret human behavior from a philosophic, religious and mystical viewpoint. Jung's theory is also distinguished from psychoanalysis (q.v.) by its stronger emphasis on teleology (q.v.) (not only causality, q.v.) as a determinant of behavior, a stress on racial and phylogenetic bases of personality, and much less emphasis on sexuality as a significant factor in the development of personality.

In explaining the dynamics of personality, Jung—like Freud—uses the concept of libido (q.v.) but—unlike Freud—does not see it as a collective concept for human sexual tendencies, but as an *undifferentiated* energy at the basis of the most varied mental processes (thinking, feeling, sensing, drive). The regulation of psychic activity is not determined by the pleasure-pain principle, but occurs autonomously by way of libido, and is determined primarily by the principles of the conservation of energy and of entropy (q.v.).

The whole personality (psyche) consists of three interacting systems: the conscious, the personal unconscious, and the collective unconscious. The midpoint of the *conscious* is constituted by the ego (q.v.), which comprises the conscious perceptions, memory contents, thoughts and feelings, and permits the individual to adapt to the environment. The *personal unconscious* consists of the personal experiences, wishes and impulses which were once conscious but were then repressed or forgotten, but are essentially capable of being once again brought to consciousness. The *collective unconscious*, the most influential psychic system, operates wholly without the conscious awareness of the individual. It is the inherited racial foundation of the structure of personality and manifests the influence of the cumulative experiences of all previous generations, and

even the animal past of the human species. The structural components of the collective unconscious are the *archetypes* (q.v.), which are universal, inherited dispositions of the human imaginative faculty, which dispose the individual to experience and behave in eternally recurrent situations (birth, death, danger, fatherhood) as his ancestors experienced and behaved in them. Some archetypes are so developed that they constitute autonomous personality systems: the *persona*, *anima*, *animus*, and *shadow*.

The *self*, an archetype which is responsible for the integration and stability of the personality, occupies a central position in the Jungian theory of personality. It is expressed in the inborn striving of the human individual toward psychic wholeness, a central process which Jung calls *individuation* (q.v.), or striving toward self-realization. Since neurosis (q.v.) is said to represent a disturbance of the process of individuation, Jung's analytical therapy aims at a restoration of this natural process of development.

Jung's typology (see *Type*) is based on a distinction between function and reaction types. Whereas function types are divided into the four basic functions of thinking, intuition, feeling and sensation, the reaction type characterizes the direction of libidinous energy. According to whether libido is oriented more inwardly or outwardly, Jung distinguishes between *introversion* and *extraversion*.

Works: The Collected Works of C. G. Jung, 17 vols. Ed. Read, H., Fordham, M. & Adler, G. London & New York, 1953–.

Some major individual works are: *Studies in word association*. London, 1918; New York, 1919. *Contributions to analytical psychology*. London, 1928. *Modern man in search of a soul*. London & New York, 1933. *Psychiatric studies* (Works, Vol. 1, pt. 1), London & New York, 1957. *Psychological types* (vol. 6). London & New York, 1971. *The structure and dynamics of the psyche* (Vol. 8). London & New York, 1960. *The archetypes and the collective unconscious*

(Vol. 9, pt. 1). London & New York, 1959. Psychology and alchemy (Vol. 12). London & New York, ²1969. The development of personality (Vol. 17). London & New York, 1954. The interpretation of nature and the psyche (with W. Pauli). London, 1955.

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W.W.

Just-noticeable difference (abb. j.n.d.). A minute difference between stimuli which is just barely above threshold: i.e. an only just perceptible physical change in stimuli. See *Psychophysics*.

Just-not-noticeable difference (abb. j.n.n.d.). The largest difference between two stimuli which is only just imperceptible.

Juvenile delinquency. The most common offenses committed by juveniles are theft and embezzlement. In the twentieth century,

and especially after World War II, juvenile crime increased far more quickly than adult crime and became an ever greater social problem. Juvenile psychology (q.v.) and criminal psychology (q.v.) investigate the causes of this development. In the practical field, child psychology (q.v.), educational counseling (q.v.), forensic psychology (q.v.), and clinical psychology (q.v.) deal with the problem of juvenile delinquency. See *Aggression; Criminality; Drug dependence*.

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F.Ma.

Juvenile psychology. A part field of developmental psychology (see *Development*). Juvenile psychology studies the psychological situation and developmental processes of juveniles in pre-puberty (q.v.), puberty (q.v.), and adolescence (q.v.). The principal areas of research are psychobiological (bodily changes, personality development) and psychosocial problems (socialization, q.v.) of youth (q.v.). Special attention is given to adaptive disorders (see *Adjustment, social*) and juvenile delinquency (q.v.). See *Child psychology; Differential psychology; Educational psychology; Infancy sexuality*.

Bibliography: Gesell, A., Ilg, F. & Ames, L. B.: Youth. New York, 1956.

F.Ma.

Juvenilism. See *Infantilism*.

K

Kallikak. A pseudonym for a much-studied family with two lines of descendants: one socially respectable, the other variously defective.

Bibliography: Goddard, H. H.: The Kallikak family: a study in the heredity of feeble-mindedness. New York, 1912. **Id.**: In defense of the Kallikak study. Science, 1942, 95, 574.

Kappa effect. If two stimuli are presented separated by a fixed temporal interval, the experienced temporal interval depends on the spatial separation of the stimuli, larger separation giving the appearance of a longer interval. This effect, which is small, occurs in both vision and touch. *C.D.F.*

Kaspar-Hauser. See *Caspar Hauser*.

Kendall's rank correlation method (syn. *Kendall tau coefficient*). A non-parametric correlation method whose use presupposes ordinal variables. The calculation is made according to

$$\tau = \frac{2S}{n(n-1)},$$

where S is the number of rank pairs of the second variables which are in the correct sequence when the first rank series is placed in its natural order. τ is not algebraically comparable with the Spearman's correlation coefficient. See *Correlational techniques*.

Bibliography: Kendall, M. G.: A new measure of rank correlation. Biometrika, 1938, 30, 1-15. **Id.**: Rank correlation methods. London, 1962. *G.Mi.*

Kendall's W (syn. *Coefficient of concordance*). A non-parametric method to determine the degree of concordance of more than two rankings. The calculation is made according to:

$$W = \frac{11 \sum D_i^2}{k^2(N^3 - N)},$$

in which k is the number of rank series and D_i the deviations of the summed rankings of the individual components from the mean of the group rankings.

Bibliography: Kendall, M. G.: Rank correlation methods. London, 1962. *G.Mi.*

Kent-Rosanoff Test. A free word-association test on Jungian principles developed by G. H. Kent and A. J. Rosanoff in 1910 for psychiatric clinics. The frequencies of reaction words for the one hundred stimulus words of the test were determined in one thousand testees, and the interpretation objectivized. Other authors standardized the answers for specialized groups.

Bibliography: Buros, O. K.: The sixth mental measurement yearbook. New Jersey, 1965. *R.M.*

Keratoscope. Also known as a Placido disk after A. Placido (1882), a keratoscope is used for qualitative determination of irregular corneal curvature (see *Astigmatism*). It is a circular disk with concentric white and black rings, and a central aperture. If the cornea of a patient is viewed through the aperture, in astigmatism the reflected circles are distorted.

K.H.P.

Keynote (syn. *Tonic*). **1.** The main, lowest note of the scale from which the passage is constructed: i.e. the first degree of the (major or minor) key, which gives the key its name. **2.** In acoustics, the lowest, overtone-free partial of a clang (q.v.) *B.S.*

Key stimulus. (syn. *Releasing stimulus*; *Re-leaser*). A trigger for an instinctive action operating through an IRM. The relevant characteristics of the stimulus object are determined in dummy sign stimuli (q.v.) experiments. E.g.: In spring the stickleback attacks rivals only when they are brilliantly colored (red belly). Although realistic stickleback dummies with no red coloration do not elicit an attack, the response occurs if a model only remotely resembling a fish but with a red base is sighted. See *Innate releasing mechanism*; *Instinct*. *I.L.*

Kinesiotherapy. Various kinds of movement therapy: relaxation exercises, breathing practice, rhythmic movement, gymnastics; also individual and group sports for relaxation, development of social ease, and the acquisition of new, or the recovery of previously repressed, somatic aspects of the individual personality. See *Autogenic training*. *W.T.*

Kinesthesia (syn. *Kinesthesia*). The perception of movements of parts of the body mediated by receptors in the joints, muscles and tendons. A *kinesthetic hallucination* would thus be the experience of a bodily movement which did not actually occur. Such a hallucination is sometimes experienced after traveling a long time on a boat. *C.D.F.*

Kinesthesiometer. An instrument for checking the accuracy of sensations of movement. Without visual checks, either passive movements are repeated actively or active movements of a specific type are directed to

previously agreed points in space. The accuracy with which the movements are repeated or the points reached is measured. *A.T.*

Kinesthetic type (syn. *Motor type*). An ideational or one of the imagination types in whom tactile and movement images predominate. Described by Stern in 1911. *W.K.*

Kinsey report. The studies known as the Kinsey Report (Kinsey *et al.*, 1948; 1953) were conducted at the Institute for Sex Research in Bloomington (Indiana, USA) founded by A. Kinsey, and were the first comprehensive, empirical scientific studies of sexual behavior. Kinsey and his colleagues conducted surveys among 5300 white males and 5490 white females over a period of fifteen years; their subjects were of widely varying age and educational groups, social strata and religious affiliations; they were questioned about their sexual behavior: e.g. masturbation (q.v.), marital and extra-marital intercourse (see *Coitus*), petting (q.v.), homosexuality (q.v.). Criticism (excluding moral rejection of the findings) has primarily been directed at the allegedly unrepresentative nature of the sample (Cochran *et al.*, 1953) and (e.g. Trilling, 1952) at the "worship of the factuality of the fact . . . the effect of suggesting a most ineffectual standard of social behavior—that is, social behavior as it exists." Beyond the results and their exemplary multivariate evaluation, the importance of the Kinsey report lies in the fact that it opened a new phase in empirical studies of sexual behavior—some of which have come from the Institute, which was continued by Gebhard after Kinsey's death. See *Sexuality*.

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York, 1955. **Kinsey, A. C., Pomeroy, W. B. & Martin, C. E.:** Sexual behavior in the human male. Philadelphia, 1948. **Id. & Gebhard, P. H.:** Sexual behavior in the human female, Philadelphia, 1953. **Trilling, L.:** The Kinsey Report. Perspectives USA, 1952, 1, 193–206.
J.F.

Kirschmann's law of contrast. In simultaneous color contrast, if there are no differences in brightness the induced color saturation is proportional to the logarithm of the saturation of the color inducing the contrast.
W.P.

Kjersted-Robinson law. The proportion of material learned during equal fractions of learning time is relatively constant for different lengths of material.

Klages' types. Three basic attitudes: (a) ego emphasis: close relationship between the ego and id; (b) elimination of the feeling of self: the ego and id are split apart (dissolution); (c) cult of images and ecstasy.

Bibliography: **Klages, L.:** Grundlagen der Charakterkunde. Bonn, 1966.
W.K.

Klang (Ger.). See *Clang*.

Kleptomania. Compulsive pathological stealing. The objects stolen often appear to be of little value to the thief and therefore are often viewed as being of symbolic value. To a Freudian the objects would have sexually satisfying qualities. To others the thefts are seen as acts of aggression against society, to assert authority, or as a revenge against material and emotional deprivation in childhood.
D.E.

Klinefelter's syndrome. A syndrome described by the American physician H. F. Klinefelter in 1942. Symptoms: hypogona-

dism with testicular atrophy, underdevelopment of the secondary sex characteristics, gynecomastia (q.v.), absence of spermiogenesis, and (frequently) eunuchoidal physique. The cause is a chromosomal anomaly with trisomia of the sex chromosomes—generally XXY.
E.D.

Knee-jerk reflex. See *Patellar reflex*.

Knowledge. 1. Simple knowledge: apprehension (q.v.); perception (q.v.). **2. Complex knowledge:** understanding (q.v.). **3. Certain** (i.e. indubitable) apprehension or understanding. "I conclude . . . that the necessary and sufficient conditions for knowing that something is the case are first what one is said to know be true, secondly that one be sure of it, and thirdly that one should have the right to be sure. This right may be earned in various ways . . ." (Ayer, 1956). **4. Accurate information.** **5. The relation between object and subject** (see *Epistemology*; *Cognition*).
Knowledge, theory of: see *Cognition theory*.

Bibliography: **Ayer, A. J.:** The problem of knowledge. London, 1956. **Wittgenstein, L.:** Philosophical investigations. London, 1958.

Knowledge of results. In psychotherapy, education (especially programmed instruction), etc.: confirmation of the accuracy or inaccuracy of a response.

Koffka, Kurt. B. 18/3/1886 in Berlin; d. 22/11/1941 in Northampton, Mass. Received his doctorate in 1908 under C. Stumpf in Berlin, with a thesis on experimental studies of rhythm theory; was an assistant of J. von Fries in Freiburg (Breisgau) in 1908/09, and of O. Külpe and K. Marbe in Würzburg, in 1909/10. As research assistant to F. Schumann in Frankfurt in 1910, he met Wertheimer and Köhler, and with them founded the Berlin school of gestalt psychology. In 1919 Koffka

became a private lecturer and in 1918 Extraordinary Professor in Giessen, where he remained until 1924. He left Germany in 1924 and taught at Cornell University in 1924/25, Clark University in 1925, the University of Wisconsin in 1926/27, and at Smith College from 1927 until his death.

Works: Koffka, Wertheimer and Köhler are considered to be the founders of gestalt psychology. Apart from his experimental work, Koffka's main contribution was his systematic presentation and application of gestalt principles to a wide range of phenomena from perception, learning, memory and development to social psychology.

Unlike Wertheimer and Köhler, Koffka formulated his gestaltist viewpoint at a relatively early stage, i.e. when, in 1923, he published the first of a series of twenty-five "Contributions to gestalt psychology". In 1915 he answered the critics of gestalt theory in his *Fundamentals of the Psychology of Perception: a Debate with V. Benussi*, and in 1919 with an article on the influence of experience on perception. In his *Principles of Psychological Development: An Introduction to Child Psychology* (1921), for the first time Koffka applied gestalt principles to child psychology. He believed that the development process is essentially the result of the interaction of internal and external conditions convergence hypothesis), and consists of an increasing differentiation of originally diffuse, qualitatively holistic experience.

Koffka's most important work, his *Principles of Gestalt Psychology* (1935), was the most comprehensive attempt yet to represent and integrate the results of gestalt psychological research in various fields (including the work of Lewin). His treatment of learning and memory may be considered the most systematic presentation of gestaltist ideas on the subject. (See *Ganzheit*.)

Koffka's learning theory is based on the assumption that learning, like other areas of behavior, can be explained by the gestalt principles of organization. New learning consists in the formation of "memory

traces": i.e. of specific excitatory gestalts in the brain which result from previous processes (physiological correlates of direct percepts) and therefore represent past experience in the present. The memory process consists of the activation of memory traces by present processes on the basis of mutual similarity. The trace system is organized in accordance with the conventional gestalt laws and is subject to pregnance. Its time-conditioned changes do not therefore consist of a weakening of memory traces (forgetting) but in a qualitative change toward a "good gestalt" with increasing regularity and sharper accentuation of special features. The typical form of learning is learning by insight, even though this may be preceded by a testing stage. Practice brings about a consolidation and strengthening of the trace system. The "law of effect" is basically acknowledged, but reinterpreted: attainment to the goal influences learning (on the basis of the gestalt law of closure) through the completion of the action gestalt. The transfer of successful solutions to new situations (transposition) is possible if the principle of solution (i.e. the dynamic structural relation) is similar.

Main works: Perception: an introduction to the *Gestalttheorie*. Psychol. Bull., 1922, 19, 631-85. The growth of the mind: an introduction to child psychology. London & New York, 1928. Principles of gestalt psychology. New York, 1935. W.W.

Köhler, Wolfgang. B. 21/1/1887 in Reval, Estonia; d. 11/6/1967, Lebanon, New Hampshire. Köhler received his doctorate in 1909 under C. Stumpf in Berlin; he then went to Frankfurt as an assistant to F. Schumann and became a private lecturer in 1911; he met Wertheimer and Koffka in Frankfurt and with them carried out the historic experiments that established gestalt psychology; he later became a co-founder of the Berlin school; from 1913 to 1920 he worked as director of the anthropoid station of the Prussian Academy of Sciences at Teneriffe,

where he conducted his famous investigations into the "intelligence" of apes. In 1921 he took over from Stumpf as director of the Berlin psychological laboratory, and was appointed Professor of psychology and philosophy in 1922. In 1935 he left Germany because of the Nazi dictatorship and emigrated to the United States; he became Professor at Swarthmore College, where he remained until his retirement in 1955. He was President of the A.P.A., a member of the National Academy of Sciences, and in 1956 received the A.P.A.'s Distinguished Scientific Contribution Award.

Works. Together with Wertheimer and Koffka, Köhler founded gestalt psychology. His major contributions on the psychology of perception include treatises on the assumption of constancy in earlier psychology, and studies of figural aftereffects. He believed that he could use the existence of figural aftereffects indirectly to prove the existence of the cortical tension fields assumed in his neurophysiological theory of dynamic "self-distribution". In his studies of constancy, Köhler was able to show that (contrary to previous ideas) there is no constant correspondence between local sensory stimuli and experimental impressions, and that a perception is influenced not only by the local stimulus but, primarily, by the organization of the visual reference system and by the stimulus constellation of the other sense organs.

In the sphere of the psychology of learning and memory, Köhler criticized the learning theories of association psychology, and in particular the principle of association (q.v.) by contiguity; his own opinion was that associations occur under the influence of gestalt organizational tendencies: the associated contents become parts of a gestalt. Spatial and temporal contiguity was important in associations only in favoring the organization of a gestalt by sheer proximity.

Köhler's most famous works are his studies of the intelligent behavior of chimpanzees. Departing from the theory of E. L. Thorndike (who reduced animal behavior to trial-and-

error learning), Köhler showed that animals are already able to act with insight, and even to use or manufacture tools to achieve their objectives.

In his gestalt theory of brain physiology, Köhler started from the assumption of a dynamic self-distribution in the physical sphere (physical gestalts) and arrived at the notion that physiological activation processes in the brain are also subject to dynamic self-distribution, and that there is a formal, topological correspondence between perceived space and the underlying physiological brain processes. See *Isomorphism; Ganzheit*.

Main works: Intelligence in apes. In: Murchison, C. (Ed.): Psychologies of 1925. Worcester, ²1927, 145–61. The mentality of apes. New York, ²1927. Gestalt psychology. New York, 1929. The place of value in a world of facts. New York, 1938. Dynamics in psychology. New York, 1940. On the nature of associations. Proc. Amer. phil. Soc., 1941, 84, 489–502. Gestalt psychology: an introduction to new concepts in modern psychology. New York, ³1957. Relational determination in perception. In: Jeffress, L. A. (Ed.): Cerebral mechanisms in behavior. New York & London, 1951, 200–43. The present situation in brain physiology. Amer. Psychologist, 1958, 13, 150–4. Perceptual organization and learning. Amer. J. Psychol., 1958, 71, 311–5. Gestalt psychology today. Amer. Psychologist, 1959, 14, 727–34.

Bibliography: Murchison, C. (Ed.): The psychological register, Vol. 2. Worcester, 1929. *W.W.*

Kolmogoroff-Smirnoff test. A non-parametric method for testing the extent to which two independent distributions match. These may be one empirical and one theoretical distribution, or, alternatively, two empirical distributions. The greatest observable difference the two summed distributions is determined as the index for matching.

Bibliography: Kolmogoroff, A. N.: Sulla determinazione empirica di una legge di distribuzione. Giornale Istituto Italiano Attuari, 1933, 4, 83–91.

Smirnoff, N. W.: On the estimation of the discrepancy between empirical curves of distribution for two independent samples. *Bull. Univ. Moscow. Ser. Internat., Sect. A2* (2), 1939, 3-8. *G.M.*

Korsakov's syndrome (syn. *Korsakov's psychosis*). An amnesic psychosyndrome described for the first time by K. S. Korsakov in alcohol-deranged individuals. The term was subsequently extended and is often now applied to all organic psychoses in which memory disorders are a dominant factor. The characteristic feature is a marked disturbance of perception and immediate memory, whereas long-term memory often remains adequate; there is a tendency to perseverations and confabulation. See *Alcoholism; Psychoses, functional*. *A.Hi.*

Korte's laws. Korte's laws concern apparent motion, i.e. stroboscopic motion produced by the intermittent presentation of stationary objects in different positions. If two objects are presented in this way, but appear successive, then apparent motion can be induced either by increasing the distance between the objects (Korte's first law) or by decreasing the time between presentations (Korte's second law). The third law states that an increase in separation of time can be compensated for by an increase in time or separation without regard to the quantitative relationship. *C.D.F.*

Koster's phenomenon. In artificially induced myopia (dispersion lines in front of the eyes) the colors of all (reduced) objects perceived appear fuller and more distinct. *F.C.S.*

Kraepelin, Emil. B. 15/2/1856 in Neustrelitz; d. 7/10/1926 in Munich. Kraepelin qualified as a doctor in Würzburg in 1878, then worked in the municipal mental hospital in Munich. He moved to Leipzig in 1882 in order to work with Wundt, whose friend he became while

still a student, but Wundt advised him against devoting himself entirely to psychology. After a short period as a private lecturer at the university clinic in Leipzig, he was appointed Professor in Dorpat in 1885, and in Heidelberg in 1891. In 1894 he edited the periodical *Psychologische Arbeiten*. From 1903 until his death in 1926 he was Professor of psychiatry and Director of the psychiatric clinic in Munich.

Works: Kraepelin became famous mainly for his contribution to psychiatric nosology, and in particular for his classification of mental disorders. He subdivided psychoses into two main groups: dementia praecox (q.v.) and manic-depressive psychosis (q.v.); his classification is fundamentally maintained by modern authors.

Despite his friendship with Wundt, Kraepelin's standpoint on the etiology of mental disorders was primarily somatic in orientation (i.e. psychological factors play no part). He considered them to result from organic brain damage, metabolic disorders, endocrinal disturbances, or hereditary factors.

Kraepelin was also important in being the first to use the methods of psychological investigation and experimentation in psychiatry. He was the first to use objective tests (q.v.) and measurements to elucidate mental disorders. He was interested in psychological time measurements, choice reactions, associations and ergography. His studies on the work process and its forms anticipated some significant features of modern learning psychology (reactive inhibition, q.v., etc.) whose discovery (according to H. J. Eysenck) was wrongly attributed to later psychologists. Eysenck believes that Kraepelin ought to be recognized as the "father of clinical psychology".

Kraepelin's third major contribution consisted in his pioneering work in psychopharmacology (q.v.), which he virtually founded. He was the first to use experimental methods to study the effects of drugs, alcohol, nicotine, etc., on human behavior.

Main works: *Compendium der Psychiatrie*,

4 vols. Jena, 1883. Einführung in die psychiatrische Klinik, 3 vols. Jena, 1901. Über die Beeinflussung einfacher psychischer Vorgänge durch einige Arzneimittel. Jena, 1892. Die Arbeitskurve. Leipzig, 1902. Über geistige Arbeit. Leipzig, 1903. Lectures on clinical psychiatry. New York, 1904 (facsimile ed., N.Y., 1967).

Bibliography: Braceland, F. J.: Kraepelin: his system and its influence. Amer. J. Psychol., 1957. W.W.

Krause end bulb (syn. *Krause ending*; *Krause's corpuscle*). A rounded neuronal receptor occurring in, e.g. the conjunctiva and genitals, and thought to be a sensory end organ for cold stimuli. See *Sense organs*.

Kretschmer, Ernst. B. 8/10/18 in Wüstenrot; d. 8/2/1964, in Tübingen. Kretschmer studied medicine in Munich (where he came under the influence of Kraepelin) and at the Eppendorf Hospital in Hamburg. He received his doctorate in 1914 with a dissertation on mania and manic-depressive symptoms; he then enlisted, and was responsible for establishing a neurological department at the Bad Mergentheim military hospital. In 1918 he left Bad Mergentheim and became a private lecturer in Tübingen; in 1926 he was appointed Professor of psychiatry and neurology at Marburg University, and between 1946 and 1959 he was Director of the neurological clinic at Tübingen University.

Although Kretschmer was a highly prolific author, his name is primarily linked to his *Physique and Character* (*Körperbau und Charakter*, 1921), in which he presented his constitutional typology. After 1946 he carried out detailed studies of constitutional and developmental physiology, and of child and adolescent psychopathology, as well as research into constitutional biology. He also tried to develop new psychotherapeutic methods and hypnotic techniques. He carried out basic research in the field of criminal behavior and made recommendations for

modifications of the penal law that would allow for adequate treatment.

Constitutional typology. Kretschmer's type theory has a morphological bias and is based on human physique. He makes a distinction between the leptosomic-asthenic type and the pyknic type. His major contribution in this field, beyond the distinction between physical types, was a classification of the relationship between these types and the three main forms of endogenous psychosis. On the basis of studies of two hundred and sixty mentally ill subjects, which have now been validated by examination of more than nine thousand cases, he was able to show that schizophrenic individuals are primarily leptosomic, manic-depressives are pyknic, and epileptics athletic.

Starting from the assumption that there is only a gradual, non-qualitative distinction between mental disorders and normality, Kretschmer established the existence of three character types (temperaments) with the same essential features (though in a much reduced form) as the corresponding psychoses from which they were derived. The schizothymic (split character, introversion, etc.) temperament (type) corresponds to the leptosomic physique (type); the cyclothymic (sudden changes of moods, affective responses, etc.) to the pyknic; and the viscous (cautious, slow) temperament (type) to the athletic type.

While the correlations between physique and psychosis postulated by Kretschmer appear relatively certain, there has not yet been any decisive confirmation of his assumptions concerning physique and character in normal psychology. See *Traits*; *Type*.

Main works: Der sensitive Beziehungswahn: ein Beitrag zur Paranoiafrage und zur psychiatrischen Charakterlehre. Berlin, ³1950. Körperbau und Charakter, Berlin, ²⁴1961 (Eng. trans.: Physique and character, New York & London, 1925). Medizinische Psychologie. Stuttgart, ¹¹1956. Geniale Menschen. Berlin, ⁴1948 (Eng. trans.: The psychology of men of genius. London, 1925). Hysterie, Reflex und Instinkt. Stuttgart, ⁵1948 (Eng.

trans.: Hysteria, reflex and instinct. London, 1961). Über gestufte aktive Hypnoseübung und den Umbau der Hypnosetechnik. D. med. Wochenschrift, 1946, 71, 29-31.

Bibliography: Eysenck, H. J.: Cyclothymia and schizothymia as a dimension of personality, I: historical review. J. Personal., 1950, 19, 123-52. *Id.*: The structure of human personality. London, 1960.

W.W.

Kruskal-Wallis test. A non-parametric method for comparing several independent samples in regard to their central trend. The observations are ranked, and the rankings of all k samples arranged in one rank order; the rank sums (R_j) of the individual samples are compared. The critical value H is determined according to

$$H = \frac{12}{N(N+1)} \left(\sum \frac{R_j^2}{n_j} \right) - 3(N+1).$$

It is distributed at $n > 5\chi^2$ with $k-1$ degrees of freedom.

Bibliography: Kruskal, W. H. & Wallis, W. A.: Use of ranks in one-criterion variance analysis, J. Amer. Stat. Ass., 1952, 47, 583-621.

G.Mi.

Kuder Preference Record. A questionnaire designed to show the relative interest for individual, comprehensive areas of vocational interest S. has to state most pleasant and most disagreeable of three activities. The test consists of ten scales presented in an interests profile, and one scale to detect dishonest answers. Standardized versions exist for children and adults.

F.G.

Kuder-Richardson Formula 20. A formula developed by Kuder & Richardson (1937) for estimating the coefficient of consistency (see Reliability) on the basis of item difficulty (p) and test value dispersion (s_x):

$$r_{tt} = \frac{n}{n-1} \left(\frac{s_x^2 - \sum pq}{s_x^2} \right).$$

It presupposes that the item-intercorrelations are approximately identical. See *Test theory*.

Bibliography: Kuder, G. F. & Richardson, M. W.: The theory of the estimation of test reliability. Psychometrika, 1937, 2, 151-60.

G.Mi.

Külpe, Oswald. B. 3/8/1862 in Candau (Courland); d. 30/12/1915 in Munich. Külpe began by studying history; he went on to psychology under Wundt in Leipzig, and Müller in Göttingen. He received his doctorate in 1887 (under Wundt) with a dissertation on the theory of sensory feeling. He then remained eight years in Leipzig, where he prepared a study of the "theory of will in modern psychology", and worked as a lecturer and as Wundt's assistant. In 1893 he published his *Outlines of Psychology*, a systematic presentation of psychology on Wundtian principles. He was appointed Professor at Würzburg University in 1894. In 1896 he established a psychological laboratory which, as the center of the Würzburg school (q.v.), became the most celebrated after that at Leipzig. In 1909 he was appointed Professor at Bonn. In 1913, he went to Munich.

The Würzburg school. Külpe founded the Würzburg school, which grounded the experimental psychology of thought processes. Apart from a short article "On the modern psychology of thought", Külpe wrote nothing else on this subject, but concerned himself primarily with philosophical questions in his publications: *Contemporary Philosophy in Germany* (1902), *Natural Science and the theory of Knowledge* (1910), *Realization; A Contribution to the Theory of the Realistic Sciences* (1912-1923). Külpe did, however, inspire the experimental studies of thought processes on which fifty of his Würzburg pupils published monographs. Other members of the Würzburg school (chronologically) were: A. Mayer, J. Orth, K. Marbe, H. J. Watt, N. Ach, A. Messer and K. Bühler.

The Würzburg school owed its foundation to Külpe's belief (in contrast to Wundt's) that the higher thought processes also can be studied experimentally. Külpe's approach was "systematic experimental introspection",

a fractionated, retrospective account of the mental processes occurring in the course of a complex task. The main result of the Würzburg school's research work was a refutation of the previously dominant idea that thinking was a combination of quasi-perceptual images.

Külpe was able to demonstrate that thought is for the most part "imageless" and "sensation-free", and takes place with only a minimum degree of conscious awareness—so that the individual stages of the thought process are hardly "experienced". On the other hand, he showed that thought is, in general, non-associative and non-mechanical, yet directed and meaningful. The "determining tendencies" (N. Ach, 1905) which allow thought a specific orientation are either conscious *tasks* and experientially perceived *objectives*, or "conscious sets" ("*Bewusstseinslagen*": A. Messer, 1906)—attitudes, habits, long-term decisions, etc.—which may be non-perceptual or unconscious. See *Thinking*.

Main works: Grundriss der Psychologie. Leipzig, 1893 (Eng. trans.: Outlines of psychology: based upon the results of experimental investigation. New York, 1895). Vorlesungen über Psychologie. Leipzig, 1922. Die Realisierung, 3 vols. Leipzig, 1912–23.

Bibliography: Boring, E. G.: History of experimental psychology. New York, ²1950. Humphrey, G.: Thinking: an introduction to its experimental psychology. London & New York, 1951. Ogden, R. M.: Oswald Külpe and the Würzburg school. Amer. J. Psychol., 1951, 64, 4–19. Titchener, E. B.: Experimental psychology, 2 vols. New York, 1901–5.

W.W.

Kundt's bisection test. When bisecting a horizontal line monocularly, there is a tendency to place the middle toward the nasal side. This phenomenon is also known as *Kundt's rule*. C.D.F.

Kundt's illusion. The illusion whereby divided distances appear greater than objectively equal undivided distances. This phenomenon is sometimes known as *Kundt's rule*. C.D.F.

Kundt's rule. See *Kundt's bisection test*; *Kundt's illusion*.

Kurtosis (Ku). The degree of flatness or peakedness (excess) about the mode of a frequency distribution (curve). If a curve has a sharper peak than the normal frequency distribution, the divergence is said to be positive (*leptokurtosis*); in the opposite case it is negative (*platykurtosis*). (An average divergence is *mesokurtosis*.) A.R.

Kymograph. A device consisting of a blackened drum or a moving strip of (smoked) paper used to record variations in the intensity of relatively protracted reaction processes (movements; muscular, pressure and temperature processes; electrophysiological processes: e.g. EEG, EKG, EMG). Since the drum or the paper strip moves at a constant speed, the graphic record obtained (kymogram) will indicate fluctuations. A.Th.

L

Lability. Flexibility; plasticity.

Labyrinth. 1. An intricate maze. 2. The complex cavity of the inner ear consisting of petrous temporal bone (the *bony labyrinth*) and a mass of sacs and tubes (the *membranous labyrinth*). Contains sense organs associated with hearing and the *static sense* (balance).
G.D.W.

Labyrinth test. See *Maze*.

Ladd-Franklin theory of color vision. A compromise between the *Young-Helmholtz* and the *Hering* theories of color vision. A four-receptor theory is proposed with separate cone mechanisms for red, green, yellow and blue. The theory accounts for color blindness and perimetry data better than the unmodified Young-Helmholtz hypothesis. The Ladd-Franklin theory holds that the various color receptors evolved from primal achromatic receptors. See *Color vision*.

C.D.F.

Laissez-faire (syn. *Laisser faire*). 1. A form of leadership, particularly in education and politics, in which the main emphasis is on democracy (q.v.) and control is minimal. 2. Neglectful or excessively permissive leadership.

Lancement experiment. One in the series of experiments by Michotte studying mechani-

cal causality. Two objects are seen in a slit moving in the same direction, with the leading object moving more slowly. When the two objects meet, the leading one continues to move at the same speed and the following one stops. Observers spontaneously report that the following object has pushed away the leading object, thus showing the subjective perception of causality.
C.D.F.

Landolt circles (syn. *Landolt rings*). Developed by E. Landolt, an ophthalmologist in Zürich and Paris (1876–1926) to test visual acuity: black circles of various sizes on a white ground.
K.H.P.

Land's effect. E. H. Land succeeded in obtaining all colors of the spectrum by using only a red and a white light. He photographed the same scene once with a red filter and once with a green filter; then he projected the first through a red filter and the second with white light, thus reproducing the original scene in *all* its colors. The surprising results of this experiment seem to accord neither with the Young-Helmholtz nor the Hering theory. See *Color theories*.
G.Ka.

Langedon-Down syndrome. See *Down syndrome*.

Lange, Friedrich Albert. B. 28/9/1828 in Wald near Solingen; d. 21/11/1875 in Marburg.

Lange obtained his doctorate at Bonn University. He taught school in Cologne and Duisburg. On account of his Socialist views he was forced to leave teaching. He moved to Winterthur in 1866. In 1869 he was made Professor of inductive philosophy in Zürich; in 1873 he went to Marburg.

Lange's position as a co-founder of modern psychology has not been sufficiently appreciated. His main work, *Geschichte des Materialismus* (History of Materialism), 2 vols., 1866–75, seemed to mark him out (and down) as a materialist, although it was a work designed, in fact, to counteract theoretical materialism. Lange developed an outline program of objective psychology about forty years before Pavlov (q.v.) and Watson (q.v.). As a neo-Kantian he fought for a non-metaphysical, physiologically based psychology, and recommended the "somatic method" and a "methodical materialism" as "preliminary" research principles. According to Lange, the *object* of psychology ought to be only that which is sensuously perceptible, together with objectively recordable responses and measurable psychological processes. His work on the principles of mathematical psychology (*Die Grundlagen der mathematischen Psychologie. Ein Versuch zur Nachweisung des grundlegenden Fehlers bei Herbart und Drobisch*, 1865) made him one of the pioneers in this field, too.

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Langerhans islet cells. Described for the first time in 1869 by the pathologist P. Langerhans, these are large, epitheloid, richly vascularized islet cells, which represent the endocrine part of the pancreas (q.v.) and produce the hormones *insulin* (q.v.) and *glucagon* (q.v.) and release them into the bloodstream. These cells play an important part in the mechanism of blood sugar regulation. Four types of cell are distinguished histologically and functionally: A, B, C and D cells. E.D.

Language. "Language" does not designate a clearly demarcated field of phenomena. The linguist Saussure made a distinction between *langue* (language as a system) and *parole* (language as an actual process, i.e. the act of speaking), the two composing *langage* (the general human faculty of speech). There are several differing approaches to the concept of language, which make intersubjective treatment difficult by reason of the various problems considered.

1. *Language as a system.* Linguistics is based on objectifications of specific natural languages (Bierwisch, 1966; Hörmann, 1970; Miller & McNeill, 1969), and attempts on the one hand systematically to describe the multi-level canon of rules (see *Grammar*) which linguistic products must obey (*synchronic aspect*); and on the other hand to investigate sequential regularities (*syntagmatic relations*) and relations or correspondences (*paradigmatic relations*) for linguistic units on various levels: phomenics, graphemes, significant elemental units (morphemes, words), phase structures, sentences, etc. Corresponding distinctions are made between phonetic/phonematic, semantic (see *Semantics*), and syntactic problems. Linguistic analysis may be concerned with the detection and elucidation of universal characteristics common to all natural languages (Greenberg, 1966), but also with the differentiation of specific linguistic codes within individual language systems (see *Sociolinguistics*; Ervin-Tripp, 1969; Herrmann & Stäcker, 1969). The theory of generative transformational grammar (Chomsky, 1968) has enlivened efforts to combine linguistics and psychology (see *Psycholinguistics*), so that even the basis of a universal behavioral theory has been seen as attainable in this area (Bierwisch, 1966; Dixon & Horton, 1968; Miller & McNeill, 1969). The idea that a child learning its mother-tongue is in principle faced with the same task as the linguist (he has to elaborate the rules of an existing language, according to which linguistic assertions can be made which satisfy the appropriate norms)

has greatly influenced the analysis of ontogenetic language development (Bellugi & Brown, 1964; Menyuk, 1969; Miller & McNeill, 1969; Smith & Miller, 1966).

In regard to *logic*, natural languages appear defective (Stegmüller, 1968). On the other hand, language systems which satisfy the requirements of logical analysis appear artificial to the linguist, and theoretically utilizable only to a limited degree (Bierwisch, 1966).

Mathematics provides algebraic formal structures for the description of the grammar (q.v.) of natural language systems (Miller & McNeill, 1969; Schnelle, 1968). The most general rules for programming languages (machine or computer languages) have been developed from the application of mathematics to logical automata.

Cultural anthropology (see *Ethnology; Sociology*) views a language as a system closely interwoven with the socio-cultural expressions of a particular culture or community, such as usage, social stratification, religious views, etc. (Ervin-Tripp, 1969; Hymes, 1964; see *Whorf's hypothesis*).

2. *Semiotics and semantics*. Linguistic constructs of the most varied kind and comprehensiveness may be conceived as signs or symbols (see *Sign and symbol*), i.e. as representations of other things. Apart from this semantic area (see *Semantics*), semiotics (q.v.) deals in a very general way with the (*syntactical*) interrelations of signs and the (*pragmatic*) relations between signs and sign-users. In addition, a semantics of a more philosophico-epistemological type refers to the truth problem (Stegmüller, 1968). "General semantics" (Hayakawa, 1949) draws attention to the arbitrary arrangement of linguistic signs and objects, and rejects "word magic".

3. *Language and communication*. The basic pattern in this regard is the reciprocal exchange of information between senders and receivers. In information theory and communications research using the transmission channel model, language is a code by means of which matter worthy of transmission is

encoded and the corresponding information is decoded. Attempts are made to apprehend linguistic activity on various levels by means of Markoff processes and to analyze its stochastic characteristics by means of computational or statistical linguistics (Herdan, 1960; Hörmann, 1970; Schnelle, 1968).

Understood in a somewhat vaguer sense, communication (q.v.) nevertheless takes place *non-verbally* in other channels: by means of looks, gestures, body postures (*kinesics*; Argyle, 1969; Hall, 1959; Sebeok *et al.*, 1964), and even linguistic communication is accompanied by meaningful pauses, accentuations, etc. (*paralinguistic communication*: Miller & McNeill, 1969; Moscovici, 1967; Wiener & Mehrabian, 1968).

The use of the term "language" in the case of animal communication has been much contested (e.g. Sebeok, 1968).

Communications research in an even wider sense is concerned with linguistic communication in interviews, in therapeutic or educational counseling, within small groups (e.g. as persuasion), and the dissemination of linguistic information by mass media (e.g. in the sense of "rhetoric"), etc. (Dieckmann, 1969; Ellingworth & Clevenger, 1967; Ervin-Tripp, 1969; Herrmann & Stäcker, 1969; Jaffe & Feldstein, 1970; Moscovici, 1967; Thayer, 1967).

4. *Language and behavior*. Psychology (see *Psycholinguistics*) apprehends linguistic events primarily in the aspect of individual experience and behavior and their conditioning factors in the individual (Dixon & Horton, 1968; Hörmann, 1970; Kainz, 1941-69; Miller & McNeill, 1969). The reception, mental application and production of language (see *Speech*) are conceived as specific modes of perception, of cognitive operation and of productive activity, which are made possible by specific (to a large extent acquired) characteristics. These bases or principles and their modifications in learning processes (see *Verbal behavior, establishment and modification of*) have to be examined by experimental (Jakubowicz, 1970; Miller &

McNeill, 1969) and free observation (Ervin-Tripp, 1969) of actual behavior, or by content-analytic methods (Herrmann & Stäcker, 1969). This can occur in terms of general-psychological as well as differential-psychological and individual-diagnostic viewpoints and problems (Gottschalk & Gleser, 1969; Guilford, 1967). In this case, the relations between linguistic and other behaviors (perception, problem solving, logical thinking, motor behavior, etc.; Kleinmuntz, 1966; McGuigan, 1966; Wathen-Dunn, 1967; Vygotsky, 1962) (see *Inner speech; Whorf's hypothesis*), and competence in several linguistic systems (bilingualism, q.v.; multilingualism), as well as their functional interaction in the language user (Hörmann, 1970) are objects for investigation.

5. *Language and the biological substrate.* Human linguistic behavior is extremely complex and presupposes the existence and functional excellence of a number of organic systems (Lenneberg, 1967), whose phylogenetic development corresponds to various linguistic activities (Révész, 1946), and which can be described in terms of morphological and physiological aspects (e.g. as a second signal system). Significant information toward research in this regard is available in pathological conditions of a morphological and functional nature (see *Aphasia*; Furth, 1966; de Reuck & O'Connor, 1964; Travis, 1963).

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G. Kaminski

Language barrier. A language may be viewed as a system, in which case it consists of (a) a number of signs (e.g. phonemes, morphemes, words); (b) a number of rules (see *Grammar*; *Syntax*) which define permissible combinations. Linguistic comprehension presupposes a common repertoire of signs and rules. A *language barrier* may exist if there is no common repertoire of signs or common set of rules. In this sense there are already language barriers between different ethnic groups. In educational psychology (q.v.), the concept relates to the typical finding that working-class children tend to show considerable discrepancies between verbal IQs (Mill-Hill Vocabulary Scale) and non-verbal, language-free IQs (Raven's Progressive Matrices) (Bernstein, 1961). It is appropriate in this case to speak of "linguistic retardation" (Oevermann, 1970) (see *Restricted code*). The term "language barrier" ought to be reserved for the relation between language characteristics and school performance. The role of school achievement as a status criterion in modern industrial societies tends to make language a variable which can block social mobility. The connection between low school achievement and language characteristics results from the frequent use of linguistic features as means of social evaluation, the lack of concordance between working-class children's rule-and-sign systems and those of teachers, and the possible blocking of the speaker's problem-solving behavior by the poor flexibility of combination rules and the semantic rigidity of much working-class language. See *Sociolinguistics*.

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Language development. See *Concept*; *Grammar*; *Verbal behavior*; *Psycholinguistics*.

Language-free tests. A group of intelligence tests which exclude verbal items and thus make no demands on oral or written language comprehension. They are appropriate for foreigners, the deaf, and the analphabetic. See *Culture-free Intelligence Tests*; *Progressive Matrices*. E.F.K.

Language laboratory. An important aid in second language instruction. Its main aim is practice to competence in the spoken language. The system uses tape recordings and multiple headphone listening systems, separate booths for each student, and a control console for the teacher, arranged so that he can monitor any student and enter into two-way communication with him. There are three main types: (a) group-work system, (b) individual system, and (c) mixed systems. In (a) the students have only a microphone and headphones, and work on a common program; only the teacher can record individual students on tape. In system (b) each student can work on an individual program in his own booth. In system (c) either course is possible. Some mini-laboratories dispense with the instructor.

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Language, psychology of. See *Language*; *Psycholinguistics*; *Grammar*; *Verbal behavior*.

Laryngograph. An apparatus for recording movements of the larynx, especially as produced in speech.

Lashley, Karl Spencer. B. 7/6/1890 in Davis, West Virginia; d. 7/8/1958 in Poitiers, France. Lashley obtained his doctorate in zoology from Johns Hopkins in 1914. In 1920 he was appointed Assistant Professor, and in 1924 a full Professor at the University of Minnesota. He went to Chicago in 1926, where at first he was research psychologist with the Behavior Research Fund of the Institute for Juvenile Research. In 1929 he became Professor at the University of Chicago. In 1935 he transferred to Harvard, and from 1937 held the chair of neuropsychology there. From 1942 on, Lashley succeeded R. M. Yerkes as Director of the Yale Laboratories of Primate Biology in Orange Park, Florida.

Lashley became noted above all for his neuropsychological research into the cortical bases of learning processes. He used psychological methods of animal learning research in order to study the function of cortical processes in learning and memory processes (see *Memory*). In particular, the results of his investigations of maze learning in rats had far-ranging effects on physiological psychology. He investigated mainly the relations between the complexity of the learning task and cerebral lesions, as well as the effects of different degrees and localizations of lesions on learning behavior. The basic technique of these studies was the designing of a maze or discrimination task for an animal, before and after which a lesion was introduced. Lashley also studied the effects of the lesion on retention and learning ability as a function of its extent and localization. His original intention (stimulated by Watson's behaviorism, q.v.—he had worked with Watson for some years) was to find the neural bases (i.e. localizations) of the acquired connections; he did not succeed in this, apart from a few visual discrimination operations. Instead he discovered that the learning deficits occurred

independently of the location of the lesions, and depended only on the size of the damaged brain area (see *Brain pathology*). Lashley then rejected (though—as he was subsequently shown—without sufficient foundation in his own results) the assumption of the existence of specific localized connections in the brain, and tried to establish a field theory of cerebral processes. According to this theory, learning (q.v.) is not an isolated phenomenon resulting from individual, anatomically (precisely) localized neurons, but a function of the entire cortex ("mass action"), and individual parts of the brain are able to assume the functions of other, damaged brain areas ("equipotentiality"). See *Localization of psychological functions*.

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W.W.

Late developer. A term for a child or adolescent whose development is seen to be rather slow, but who nevertheless finally achieves an average level of competence.

The term "late developer" is a not very accurate description for widely varying cases with many determining factors.

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Latency period (syn. *Latency stage*). In Freud's schema of libidinal human development, the period from about the sixth to the twelfth year of life: the time between the end of the early and the beginning of the late genital stage, i.e. puberty. In this period the child's sexual interest in members of his direct family, especially the parent of the opposite sex, and conflicts with the parent of the same sex, are said to become latent. This does not mean that the child's sexual interests disappear. In the extra-family context, sublimated and occasionally direct sexual interests are pursued, and are often more clearly remembered in retrospect than the sexual interests of the early genital stage. See *Genital stage*.

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Latent dream contents. Unconscious dream motives and wishes which are said to be expressed in the manifest dream content. In psychotherapeutic and psychoanalytic dream analysis (q.v.) they are deduced from the material of the manifest dream content and from the dreamer's memories of the manifest dream content. Errors are possible. Rejection by the dreamer is said possibly to result from his psychological resistance to conscious awareness of the latent content. See *Dream*.

W.T.

Latent period. 1. The interval between stimulus and response. **2.** See *Latency period*.

Laterality (syn. *Cerebral dominance*; *Lateral dominance*). The structure or function of paired organs, or of two similarly arranged areas of a non-paired organ, distributed on the right and left sides of the body. Whereas *ambilaterality* refers to a morphological and/or functional equivalence of both sides, *lateral dominance* refers to a qualitative or quantitative primacy or preference for one side. Research into laterality is mainly concerned with functional asymmetries, and above all those that are motor or sensory, and those pertaining to the central nervous system (q.v.). *Manual dominance* is considered in terms of preferential use of one hand (see *Handedness*) and relative dexterity on a basis of, e.g., the differential excitability of paired muscles. There is a 1 to 30% range of difference in various authors' assessments of the distribution of left-handedness. An investigation by Annett (1967), which is also of theoretical interest, is based on manual practice and gives the following distribution of degrees of preference: 70% of Ss. from various populations were stable right-handers whereas 4% were stable left-handers; 26% of cases were in the unstable handedness group. Analysis of existing studies supports the suggestion that the problem of handedness also requires systematic investigation in the area of psychomotor research.

Concepts of *ocular dominance* are based on preferential eye use, directive dominance, the phi phenomenon (q.v.), relative visual acuity, and retinal rivalry phenomena. Investigations into *auditory dominance* on the basis of dichotic hearing are—like those into visual dominance—connected with problems of cerebral asymmetries of a functional nature. Existing psychological research findings and those of the appropriate neighboring disciplines together show that the cerebral functions fundamental to motor activity, sensory activity and speech feature a differentially asymmetrical distribution over the cerebral hemispheres. *Cerebral dominance* does not indicate any uniform predominance of one half of the endbrain for all cerebral

functions, but a preference for one cerebral hemisphere in specific activities (Mountcastle, 1962; Zangwill, 1960, 1964; Hécaen, 1968). Investigations into the *relations* between different manifestations of lateral dominance do not as yet offer any uniform picture (Subirana, 1969). Results of clinical studies by Milner, Branch & Rasmussen (1964) regarding the relation between handedness and speech lateralization would seem to approximate conditions in the normal population: 90% of the right-handers showed a speech lateralization of the left cerebral hemisphere, and 10% one of the right hemisphere; left-handed and ambidextrous persons without any sign of an early left-side brain lesion were divided into 64% with a speech dominance of the left side, 20% with one of the right side, and 16% with a bilateral speech dominance. Left-handers and ambidextrals with an early left-side brain lesion showed a division of 22% with a left-side and 67% with a right-side speech dominance; 11% gave evidence of bilateral speech representation. Connections between laterality variables, on the one hand, and functional disorders (legasthenia, q.v.; speech disorders, etc.), accidents, personality traits, hypnotic suggestibility, etc., on the other hand, require further clarification. Experimental findings and socio-cultural manifestations appear to show that human-specific laterality is not confined to individual motor and perceptual activities, but is in many respects transferred to, and co-determines, the whole range of experience and behavior.

As a set variable, lateral dominance is a determinant of human experience and behavior (J. F. Ullmann, 1971), without which the higher forms of human performance would be impossible. Laterality research with an interdisciplinary emphasis opens up significant perspectives for human psychology (I. M. Ullmann, 1971). Recent conceptions of the functional differentiation of the endbrain hemispheres together with divergent results of reaction experiments, investigations of lateral asymmetries, visual half-fields and dichotic

hearing tests suggest that differential functionality is the appropriate basis for a concept of lateral dominance offering considerable scope for further research. See *Aphasia; Brain pathology; Neuropsychology*.

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Latin square. A factorial experimental design used when individual factor combinations, as in a complete experimental plan, are not possible. In the first square, the *k* conditions are arranged in a *k* × *k* matrix so that they occur only once in every line and column. An example for *k* = 4 is:

A	B	C	D
B	A	D	C
C	D	A	B
D	C	B	A

G.Mi.

Latitude of acceptance. In the rating of attitudes or opinions: that range of values on the opinion or attitude scale representing values which S. still accepts or does not

yet reject. A range of tolerance on either side of the individual's standpoint. Similarly, *latitude of rejection* is the range of objects of opinion which S. finds unacceptable. See *Attitude*. H.D.S.

Laughter. Recent findings would seem to show that laughter is genetically inborn and not specifically human, although experience and maturation make their contributions to the developed expression. See *Humor*.

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Law of averages. According to Bernoulli's theorem, when there is an infinite approximation to 1, and if the number of trials is large enough, in the long run the relative frequency $f(X)/N$ (i.e. of occurrence of event X) will differ very little from the basic probability (of this event). W.H.B.

Law of comparative judgments. See *Scaling*.

Law of effect. See *Effect, law of*.

Laws in psychology. As an empirical science, psychology is based on a complex interaction of theory and empirical experience. One major aspect of this process is the formulation of hypotheses applicable to general conditions, which—after verification—are known as laws. The individual is defined approximately in a network of general laws, which is as dense as possible. Opinions differ as to the type of laws which it is possible to formulate in psychology. The prevailing concept (e.g. Brunswik, 1943; Sarris, 1967) is that because of the complexity and variability (inter-individual and intraindividual variation) of the phenomena of life, laws of probability are requisite; on the other hand, authors such as Hull (1943) maintain the opposite view: i.e. that exact, natural-scientific laws are

needed in psychology. Madsen (1968) integrates both positions and suggests that the exact, natural-scientific law must be considered as a positive boundary case of laws of probability.

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Leader. One who plays a role that varies with the course of *group formation* (q.v.) and is bound up with expectations as to the direction, control and modification of the activities of the other group members with a view to achieving group aims.

Attempts to find an enduring syndrome of personality traits describing the leader otherwise than in terms of the characteristics of his followers have failed. Researchers, therefore, focus attention on the concrete behavior of leaders of various groups in different situations (Gibb, 1954). See *Group dynamics*.

The attributes of group leaders include those that enable someone in a particular situation to contribute in a large measure to the satisfaction of group members and to the achievement of the common goal, or those that lead the other members to believe that such is the case. Where a particular group is interested mainly in performing a specific task, its leader will display in a high degree the abilities required for achieving it to the greatest advantage (task ability and task specialist, according to Bales, 1950). On the other hand, where the needs of group members tend to be of a socio-emotional kind that has to be satisfied in group activities, their leader can do even more to help gratify such needs: Bales, 1950; Thibaut & Kelley, 1959). In general, the standing of an individual

within a group rises with the extent to which he identifies himself with the norms and aims of that group (Homans, 1950).

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A.S.-M.

Learning. Even though learning has received more attention in terms of experiments than any other object of psychology, there is no one accepted definition of the term. Nevertheless, the various attempts to define it may (without too great a degree of misrepresentation) be formulated as follows: Learning consists of relatively persistent changes in possible behavior insofar as they derive from experience. This restriction of the term excludes short-term changes (adaptation, fatigue, etc.) and those which derive from certain structural alterations of the central nervous system (maturation, aging, injuries). Possible behaviors are in question since actual, concrete behavior is always dependent on further conditions, above all on changes in motivation; therefore a distinction is made between learning and *performance*, which raises methodological problems in regard to the assessment of *learning curves* (q.v.). Many authors replace the reference to experience with terms such as "repetition", "practice", "training", etc., in order to avoid terminology reminiscent of the psychology of *consciousness* (q.v.); nevertheless, the information theory (q.v.) model would seem to make it possible to interpret experience (without recourse to the psychology of consciousness) as the *reception and processing of information* (q.v.). The limitation of the term "learning" to *adaptive* changes of behavior is usually rejected, since the derivation of (at least objectively) unadapted behavior patterns (e.g. neuroses) from learning processes should not be excluded. The restriction of the defini-

tion to *behavior* is primarily one of method; a disadvantage is that the definition is then too far removed from everyday usage, which employs "learning" primarily in the sense of the acquisition and alteration of cognitive structures (learning in school, etc.).

Western tradition attributes learning to the establishment of associations between elements. Of the three laws of association cited by Aristotle (similarity, contrast, temporal and spatial contiguity) only the last-mentioned is still generally applied (temporal contiguity). With the rise of experimental psychology, association (q.v.) between the contents of consciousness (mental elements such as ideas and images) was replaced by association between signals (stimuli) and responses. Instead of the word "association", *conditioning* is now used, in the sense of conditioned responses and signals. The resulting connection is interpreted physiologically—though diversely (see *Association; Conditioning, classical and operant; Engram; Memory*).

Methodological and theoretical work in the field of learning is essentially indebted to the major experimental paradigms of Pavlov (q.v.) (*classical conditioning*) and Thorndike (*instrumental conditioning*). Pavlov's model posited temporal contiguity as the basic explanatory principle for the changes of behavior in question, whereas in instrumental conditioning the effect of the response (see *Effect, law of; Feedback*) is also important.

For *behaviorism* (q.v.), prediction of behavior on the basis of general laws of learning and a knowledge of the individual history of learning became the central task of psychology. A general learning theory (see *Learning theory*) was postulated for all modes of learning and behavior, in humans and in all other biological species. Experimental investigations were carried out primarily on easily manipulable laboratory animals, for the most part white rats. By far the most proficiently developed theory of learning was that of Hull (q.v.) (1943).

The original behaviorist expectation that it would be possible to elaborate *one* universal

learning theory proved as generally unacceptable as the methodological and theoretical restrictions of behaviorism. Since about 1950 that initial confidence has been somewhat muted. Instead there is a concern to develop *special theories* (learning models) for individual mechanisms (e.g. the effect of *reinforcement*, q.v.), or areas of learning research (e.g. verbal or motor learning). Differences between biological species are taken into consideration, and attempts are made to classify them systematically. Experiments are carried out to determine whether special learning processes (e.g. imprinting, q.v., incidental learning, learning in sleep, q.v.) follow particular laws. Terms from the psychology of mentalism or consciousness are again employed as intervening variables (e.g. attention, q.v., expectation, fear). Instead of the search for fundamental mechanisms, learning processes which are especially important in the human socialization process (learning by instruction, imitation, etc.) or in psychological treatment (e.g. desensitization: see *Behavior therapy*; *Aversion therapy*) are examined directly in terms of complex variables, and classified according to the particular characteristics of the learning task. See *Educational psychology*; *Educational science*; *Instinct*.

Bibliography: Borger, R. & Seaborne, A. E. M.: The psychology of learning. Harmondsworth, 1966. Bruner, J. S. (Ed.): Learning about learning. Washington, 1966. De Cecco, J. P. (Ed.): Human learning in the school. New York, 1963. Gagné, R. M.: Learning and individual differences. Columbus, 1967. Hull, C. L.: Principles of behavior. New York, 1943. Kimble, G. A.: Hilgard and Marquis' conditioning and learning. New York, 1961. Thorpe, W. H.: Learning and instinct in animals. London, 1963.

F. Merz

Learning ability (syn. *Learning readiness*). A supposed personality trait to which individual differences in learning outcome (speed, amount, etc.) in different assignments may be attributed. Empirical investigations would seem to refute the existence of a *single* "learning" ability (cf. Pawlik, 1968, ch. 13). (See *Abilities*; *Begabung*; *Differential psychology*).

Bibliography: Pawlik, K.: Dimensionen des Verhaltens. Berne, 1968. K.P.

Learning, associative. See *Learning, rote*; *Memory*.

Learning by imitation. See *Imitation*; *Imprinting*.

Learning by insight. As a concept, insight is central to the approach adopted by gestalt theory to the psychology of learning and thinking. Although W. Köhler sought to show as early as 1917 that insight can be defined exclusively by using behavioral data (smooth development of the solution, very sudden behavioral reorganization), this concept remained a principal point of attack for neobehaviorists. (See *Neobehaviorism*.) Osgood's approach in his mediation theory is characteristic of neobehavioral attempts to replace insight by other constructs. This argument about insight as a construct would presumably have been superfluous had the representatives of the two lines of thought clearly declared different plans of research. Gestalt theory worked chiefly in the field of the psychology of thought and studied how patterns of behavior which have already been firmly acquired are reorganized into relevant behavior for supplying a solution. The construct of *insight* was intended to explain this reorganization. As regards the choice of the word, it was certainly no coincidence that gestalt theorists approached problems in the psychology of thought from the angle of that of perception (cf. in this respect, M. Wertheimer's "rho-relation"). In the behaviorist psychology of learning, a construct such as insight was superfluous so long as S-R associations formed the exclusive subject of interest. One object of this study was the systematic exclusion of already acquired behavior patterns; "unnatural" responses were usually demanded from the animals used

in the experiments (pressing bars, opening puzzle boxes, running through mazes: cf. in this connection, the criticism of Köhler and the ethologists, e.g. K. Lorenz). The organization of previously acquired behavior patterns raises problems for the behaviorist only when he examines questions posed by the psychology of thought (cf. Osgood's mediation theory and Maltzmann's habit-family-hierarchy hypothesis). It is possible that a more satisfactory explanation of the problems connected with the concept of insight will be found along the lines of subjective behaviorism as suggested by Miller. According to this, insight could be the creation of a (probably linguistic) metaprogram or solution plan which controls the application of subordinate programs (patterns of behavior) already established and available.

Bibliography: Köhler, W.: The mentality of apes. New York, 1927. Maltzmann, L.: Thinking: from a behaviorist point of view. Psychol. Rev., 1955, 62, 275-86. Miller, G. A., Galanter, E. & Pribram, K. H.: Plans and the structure of behavior. New York, 1967. Osgood, C. E.: Method and theory in experimental psychology. New York, 1954. *M.Ba.*

Learning curves are constructed in order to represent learning progress in successive presentations of the learning material or in successive trials. Prerequisites for the construction of a learning curve are *constant* learning conditions in the individual trials (e.g. the same motivational situation) and a measure for effective learning that can be used throughout all trials. Two variables which are decisive for the type of curve selected are complexity of assignment material and stage of learning. Positively accelerated curves tend to be obtained at an earlier stage of practice and negatively accelerated curves at a later stage. There may be more or less extensive intermediate stretches without any noticeable learning increment. Interpretations of learning curves are problematical since it is not clear to what extent each learning curve is an artifact of a specific evaluation method.

Bibliography: Osgood, E.: Method and theory in experimental psychology. New York, 1953. *M.Ba.*

Learning, discriminative. Discriminative learning tries to select the characteristics of a stimulus situation which serve as guidelines for purposive behavior. In all experimental arrangements, Ss. have to learn to respond discriminatively to different stimuli. Appropriate experiments test not so much perceptual acuity for similar stimuli as attention to individual dimensions, or regularities in complex stimulus patterns.

Bibliography: Reese, H. W. & Lipsitt, I. P.: Experimental child psychology. New York & London, 1970. *H.G.*

Learning disorders (syn. *Learning disabilities*). General or partial underachievement (q.v.) or inadequate performances below the individual ability and developmental level, which are disorders in the motor (e.g. sensorimotor skills), cognitive (e.g. concentration, attentiveness), motivational (e.g. anxiety, q.v., laziness, resignation), and somatic (e.g. exhaustion, vegetative dystonia, q.v.) areas.

Theoretical explanatory models and derived therapies are offered by educational psychology (q.v.), learning psychology (see *Aversion therapy; Behavior therapy*), depth psychology (q.v.) and psychopathology (q.v.). There is an increasing tendency to view learning disorders sociologically: the excessive demands of an achievement society (q.v.) are seen as responsible for many of these educational problems. See *Child psychology; Educational guidance; Mental defect; Autism*.

Bibliography: Robinson, F. P.: Effective study. New York, 1961. Tarnopol, L. (Ed.): Learning disabilities. Springfield, Mass., 1969. *H.Ma.*

Learning, distributed (syn. *Distributed practice*). The total number of learning trials is distributed over a longer period by inserting intervals. In *massed learning*, on the other hand, the trials follow one another directly. See *Practice*. *F.M.*

Learning, fractionated (syn. *Part learning; Learning by parts*). If a more extensive piece of matter, e.g. a word list or a motor task (such as a piece of piano music) has to be learnt, most individuals "fractionate" the process: they divide the material into parts, each of which is to be learnt "independently". In part learning pure and simple, S. first learns all the parts separately, then in combination; in the progressive and repetitive part-learning methods (McGeoch & Irion, 1952), S. adds newly-learned parts to the recalled whole. *Global learning* (whole learning, learning by wholes) is contrasted with fractionated learning. The results of studies to find the better method are not wholly in agreement: motivation, learning level already attained and individual differences play their parts, whereas the type of assignment shows no general influence. Partial successes with fractionated learning can be encouraging; in later stages of learning the global method is more successful, and its superiority increases with developmental age and intelligence. Altogether, the findings seem to show that global learning is superior; in motor tasks the combination of the individually learned parts (e.g. for each of the two hands) can take as much time as immediate global learning.

Bibliography: Hovland, C. L.: Human learning and retention. In: Stevens, S. S. (Ed.): Handbook of experimental psychology. New York & London, 1951, 640-2. McGeoch, I. A. & Irion, A. I.: The psychology of human learning. New York, 1952, 499. F.M.

Learning, global (syn. *Whole learning; Learning by wholes*). The assignment is repeated as a whole (globally) until the learning criterion is reached. F.M.

Learning, incidental. In contrast to goal-directed (i.e. *intentional*) learning, incidental learning features no intention to learn on the part of the subject. The following is the operational definition used in research: Learning is incidental when no instruction is

given to learn the material tested later. Experiments in incidental learning hitherto have been mounted as memory experiments: an orientation task (e.g. sorting) is used to introduce testees to the material to be tested later; in some experiments the orientation task consists of learning, but other aspects or parts of the material (e.g. colors instead of shapes) than those Ss. were instructed to learn are tested later.

Incidental learning plays a major role in everyday life. Therefore it is of interest to know whether regularities or laws found in intentional learning also occur in incidental learning. It was shown that in incidental (as compared with intentional) learning, the number of presentations plays a less important part, performance tends rather to drop with increasing motivation, and no Restorff effect (q.v.) is found in salient items; individual differences in performance seem to be greater. Proactive and retroactive inhibition (q.v.) occur comparably.

Bibliography: McLaughlin, B.: "Intentional" and "incidental" learning in human subjects. The role of instruction in learning and motivation. Psychol. Bull., 1965, 63, 359-76. F.M.

Learning, insightful (syn. *Learning by insight; Judicious learning*). 1. Insightful learning is said to occur if the change in behavior comes to pass through (spontaneous) recognition of the task structure; the contrary procedure is "blind" trial-and-error behavior. A somewhat less restrictive definition would include detour behavior not built up by trial and error. E.g.: in a maze, an animal not only acquires specific response sequences but behaves as if it knew their spatial structure: if the direct route to the goal is blocked, the longer way will be taken without any significant delay (the construction of "cognitive maps"). Accordingly, insightful learning occurs whenever, after the learning of more simple rules, behavior follows new and more general rules. If the principle of solution can be transferred, problem-solving is the typical

form of insightful learning. See *Insight*; *Detour action*. 2. See *Learning by insight*.

Learning, instrumental. In instrumental learning, the learner's reaction conditions subsequent signals: certain responses lead to reward or punishment, or to success (see *Conditioning*). The reinforcement by need-gratification, etc., of the responses given is cited to explain a learning increment in instrumental conditioning—in contrast to classical conditioning, where only the temporal contiguity of signals leads to learning. *Behavior shaping* is a special form of instrumental learning: in this case each approximation to the desired behavior is rewarded, so that the behavior to be acquired is formed gradually.

F.M.

Learning, intentional (syn. *Goal-directed learning*). Learning with intention, as contrasted with *incidental learning*.

F.M.

Learning, latent. Changes in behavioral possibilities which are not directly expressed in alterations of performance and therefore remain latent. Relevant experiments in latent learning (animal behavior, e.g. reinforced only in the second trial) led to a lively discussion in behaviorist circles in regard to the value of the reinforcement and contiguity principles in explaining learning (see *Reinforcement*). Latent learning would seem to show that reinforcement is *not* a necessary condition for learning. Hence even the existence of latent learning was contested, e.g. by the introduction of additional theoretical variables (e.g. curiosity or adaptation to the situation improve later learning).

In memory (q.v.) research, latent learning is admitted as existing in the form of incidental learning. Similar phenomena are *immanent* and *latent practice* (see *Practice*). Immanent practice denotes behavioral changes by repetition which lead not to improved

performance but to diminished difficulty.

As in the case of latent learning, latent practice indicates an especially quick increment obtained if the preceding practice occurred under conditions adversely affecting performance (e.g. drugs capable of impairing performance), so that no improvement in performance occurred initially.

Bibliography: Düker, H.: Über latente Übung. Archiv. ges. Psychol., 1965, 117, 54–66.

F.M.

Learning machine. A system used to objectify learning processes. In most cases learning machines (or *automata*) simulate the formation of conditioned reflexes (see *Conditioning*) or trial-and-error learning. See *Automata theory*; *Machine learning*; *Instructional technology*; *Cybernetics and psychology*; *Learning, trial-and-error*.

H.F.

Learning, massed (syn. *Massed practice*). Learning or practice trials may follow one another directly (*massed learning*) or (as in distributed learning, or *practice*) may be separated by intervals. This distinction is not to be confused with the similar one between *fractionated* (part) and *global* (whole) learning.

The results of investigations generally show distributed learning to be superior. Exceptions may be attributed to the following factors: the advantages of distributed learning may be concealed by warming-up effects; too long intervals may lead to complete forgetting; massed practice can prove superior if very variable behavior leads to the same success. The kind of matter assigned would seem to have no influence; nevertheless, distributed learning is relatively superior in the case of more extensive assignments. The superiority of distributed learning may be attributed to a number of factors: during intervals the tasks may be recalled quietly; intervals reduce the fatigue that has occurred; unbroken practice can reduce motivation, etc. A general theoretical concept to explain the superiority of

distributed practice is *reactive inhibition* (q.v.). According to H. J. Eysenck, extraverts profit relatively more from distributed practice since they develop reactive inhibitions more quickly than introverts—a prediction confirmed by tests.

Bibliography: See *Learning; Practice*. F.M.

Learning, meaningful (syn. *Significant learning*). 1. The cognitive acquisition of rules leads to the acquisition (or easier acquisition) of the learning assignment. 2. The more general meaning of an assignment is learned without S. necessarily possessing any ability to reproduce details in full. In both cases, meaningful learning presumes that the assignment can be processed cognitively, i.e. that *rules* are derivable (see *Learning, insightful*), and therefore refers to meaningful material which may, however, also be appropriate for mechanical learning. The superiority of meaningful to mechanical learning may be seen in the fact that in meaningful learning it is necessary to store a *smaller* quantity of information (during testing it is *reconstructed*, not reproduced or retrieved from storage).

Bibliography: Ausubel, D. P.: Educational psychology. A cognitive view. New York & London, 1968. Bruner, J. S.: The process of education. New York, 1960. Id.: Towards a theory of instruction. New York, 1966. Katona, G.: Organizing and memorizing. New York & London, 1967. F.M.

Learning, mental (syn. *Mental training; Mental practice*). Changes in behavioral possibilities which arise without open behavior and only through *cognitive* processing of the assignment. The demarcation in regard to problem-solving and insightful learning is not unequivocal. Mental learning is most clearly evident in motor tasks. Operational definitions also differ markedly. E.g., it is defined as learning by observation of the performance of others (see *Imitation*); as “imaging” of the requisite movements; or as verbal description of the experimenter. Even though

our educational and training systems depend to a large extent on such (and similar) techniques, there are only a few relevant investigations and no systematic presentations of their relative value. Clearly the type of learning task is important for the effectiveness of mental learning. Problem solutions or detour behaviors can be directly passed on by mental training. Investigations are therefore concerned mainly with motor learning. Even in such assignments, various kinds of mental training can produce quite positive results. Various factors are adduced to explain the positive effects of mental learning: implicit motor responses, verbalization, etc. See *Practice; Motor skills*.

Bibliography: Ulich, E.: Das Lernen sensumotorischer Fertigkeiten. In: Bergius, R. (Ed.): Handbuch der Psychologie, Vol. 1, ii. Göttingen, 1964, 337–9. F.M.

Learning method. Used in early memory research (H. Ebbinghaus) for quantitative determination of memory capacity. Memory capacity is determined by the number of presentations of the assignment needed for accurate reproduction by the testee. The learning method therefore studies the learning conditions which must be fulfilled for a clearly defined subject to be completely retained in the memory. See *Memory*. P.S.

Learning methods. When making learning assignments, different methods may be used, according to the (learning) type (q.v.), in order objectively or subjectively to increase effective attentiveness and retention: e.g. association of the matter with known significant phenomena, whole or partial appropriateness of content, temporal distribution of learning, and systematic alternation between the stages of acquisition and exposition.

Bibliography: Katona, G.: Organizing and memorizing. New York, 1949. H.Schr.

Learning motivation (syn. *Motivation to learn*). An improvement in performance without optimal motivation (q.v.) is impossible in the

long run. The most primitive form of learning motivation consists in the construction of compulsive situations, in which "pressure-barrier situations" and "goal-attraction situation" interact (W. Metzger). H. Roth and W. Correll have produced further theoretical approaches (see *Intrinsic*) with the analysis of primary and secondary motives (oriented to things and persons). The notion of an intrinsic purpose-dynamics as a motivational factor in the student is, according to Rosenfeld (1966), widespread in Western educational theory and practice, whereas in the East biologicistic and dialectical conceptions are the rule.

Bibliography: Rosenfeld, G.: *Theorie und Praxis der Lernmotivation*. Berlin, 1966. *E.U.*

Learning, motor. The acquisition of behavioral possibilities defined in terms of motor performance (e.g. piano playing, cycling, etc.). The distinction between this and other forms of learning is not always clear, since, for the most part, motor functions are also implicated (e.g. detour learning). However, other kinds or types of learning (verbal learning, the acquisition of cognitive structures) are obviously excluded. The results of motor learning are motor skills (q.v.). Motor learning is described as the formation of chains between individual movement units; however, the individual movements for highly-practiced skills occur more quickly than would be possible in a sequence of individual signal-response units. Therefore it must be supposed that the individual motor patterns are comprised in superimposed units whereby sensory control over the effect of the individual movement is partly surrendered. In simple hand movements, e.g. one assumes that movement is controlled by at least two sensory systems in the manner of control circuits: in the course of the learning process, visual control (*exteroceptive feedback*) is suppressed in favor of an inner control circuit (*proprioceptive feedback*). All motor learning

processes may be conceived as the formation of increasingly complex coordinations, which relate both to the coordination between different movements and to that between muscular movement and sensory processes. Sensorimotor learning is especially important in the first twelve months of life, as Piaget (1947) emphasizes. In the course of development (q.v.), however, new sensorimotor processes occur. The relevant investigations are mostly concerned with practical and relevant questions in such fields as sport or control tasks. See *Motor skills*.

Bibliography: Fitts, P. M.: Perceptual-motor skill learning. In: Melton, A. W. (Ed.): *Categories of human learning*. New York, 1964. Piaget, J.: *The psychology of intelligence*. London, 1947. *F.M.*

Learning, operant. See *Conditioning, classical and operant*.

Learning, perceptual (syn. *Perceptive learning*). The alteration of behavioral possibilities resulting from changes in perception. The question of the existence of perceptual learning played an important part in the empiricism vs. nativism discussion within the psychology of perception. It is useful to distinguish *mental learning* (q.v.) from the perceptual variety. Spectacle experiments (see *Stratton's experiment*) are typical modes of investigation into perceptual learning. Prisms or mirrors are used systematically to disturb perception: e.g. one's image of the environment is turned upside-down; through perceptual learning the disturbance is wholly or partly compensated after some time, i.e. the testee sees the world upright again. In the meantime, however, it has been adequately proved that this reorganization of disturbed perception depends on the extent of the testee's motor activity. With reduced motor activity (S. sitting quietly, head still) there are special motor adaptation processes (e.g. the hand shows at a point corresponding to the changed

perceptual conditions), without any change occurring in perception. The question whether motor or perceptual learning has occurred is decided by testing the kind of co-practice (see *Practice*). In perceptual learning, the learning sequence generalizes by way of different motor effectors, e.g. from one hand to the other. A more specialized application of the term is its use for the increasing specificity of perception with a constant physical stimulus constellation.

Bibliography: Epstein, W.: Varieties of perceptual learning. New York, 1967. Wohlwill, J. F.: The definition and analysis of perceptual learning. Psychol. Rev., 1958, 65, 283-95. F.M.

Learning, productive. Learning with maximum transfer (Bergius, 1964). The possibility of transferring behaviors to other situations depends (among other factors, e.g. distribution of repetitions) on cognitive processing of the situation. If problem-solving is defined as a variety of learning, then productive learning may be said to occur when the solution principle that is found can be transferred to other situations.

Bibliography: Bergius, R.: Übungsübertragung und Problemlösen. In: Bergius, R. (Ed.): Handbuch der Psychologie, Vol. 1, ii. Göttingen, 1964, 321. F.M.

Learning, receptive. The insertion of meaningful material in existing knowledge. Largely synonymous with *apperception* (q.v.) or *apprehension* in Scholastic usage. F.M.

Learning, relational. Relational learning occurs when behavior depends not on specific individual signals but on the *relation* between two or more signals. In a typical experiment the choice of the larger (or brighter, etc.) of two objects is rewarded, and all other signal parameters (say distance or position) are varied in such a way that no direct signal-

response connection can be formed. Other experiments require the selection of the deviant object from a series of similar objects (*oddity problem*) or the choice of the one of two objects that is just like a third (*matching behavior*). In somewhat more complex investigations the way in which the acquired relation is transmitted is the object of the tests. When S. has learnt to choose a square of average size, in a new series the largest one is omitted and a new, smallest square is added. If the median square is again selected, then one speaks of *transposition behavior*. Even more complex still are investigations in which signals are used which vary simultaneously in two dimensions, say color and form. In these cases the object of the test is whether relearning occurs more quickly if the change in meaning occurs within the relevant signal dimension (*reversal shift*), or if the second signal dimension is decisive for the reward (*non-reversal shift*).

The theoretical interpretation of such tests is largely concerned with the question whether learning under these particular conditions is to be assessed as the acquisition of signal-response connections or on the assumption of mediating processes. Unequivocal interpretations are difficult, since diverse assumptions on the generalization (q.v.) of learned responses (*generalization gradient*) are possible, and because the first learning attempt in each case may lead to the acquisition of learning sets which exert a specific influence on later learning.

Bibliography: Herbert, J. A. & Krantz, D. L.: Transposition. A reevaluation. Psychol. Bull., 1965, 63, 244-57. F.M.

Learning, rote (syn. *Mechanical learning*; *Associative learning*). The impression and retention of learning matter independently of the active processing by S. of the information to be stored. Since neither motor behavior nor the cognitive processing of the situation is taken into consideration, the

relevant investigations are frequently described as *memory experiments* (mechanical or associative memory). Since the first efforts in this area by Ebbinghaus (1885) they have for preference been carried out using meaningless verbal material (e.g. nonsense syllables). In experiments, retention and forgetting curves are usually produced from group activities; recently individual curves have also been used (in which case, instead of the number of correctly reproduced learning items the reproduction times are taken into account as well). The variables examined concern conditions either during imprinting/impression of the material (e.g. activity of the individual, distributed or massed presentation, etc.) or, less often, during retention; however, the results also depend on the type of memory testing used (see *Retention curve; Memory*).

In regard to the interpretation of results, it is generally asked whether the findings can be explained by a "mechanical" association model, or a "cognitive" processing of the material by Ss. It is often sensible to assume cognitive processing in the imprinting stage and even during the retention phase (Bartlett, 1932).

Bibliography: Bartlett, F. C.: *Remembering*. Cambridge, 1932. Krech, D. & Crutchfield, R. S.: *Elements of psychology*. New York, 1960, 409-30. *F.M.*

Learning, sequential. The acquisition of an ordered series of behaviors. Preferred test arrangements are the learning of word lists and mazes. Insofar as a distinction is to be made between *serial* and *sequential* learning, sequential learning is understood as the acquisition of a number of *individual sequences* (in the simplest case pair-associations), and serial learning as the acquisition of the single series of elements. In the latter case the term "serial" can refer only to the method used, so that it is possible to make a distinction between serial presentation and serial reproduction. Social features of sequential learning are usually apparent both in verbal and in

motor tasks (e.g. positional effects); nevertheless, both kinds of learning are usually treated separately.

Bibliography: Dixon, T. R. & Horton, D. L.: *Verbal behavior and general behavior theory*. Englewood Cliffs, 1968. Osgood, C.: *Method and theory in experimental psychology*. New York, 1953. *F.M.*

Learning sets. The term was first used by Harlow (1949) to denote an improvement in performance in the course of a series of learning tasks with differing stimuli (e.g. objects), each task being similar in type from the solution angle. In discrimination learning, for example, the simultaneous discrimination of different pairs of differing stimuli is practiced through a number of problems. In a small and constant number of trials, in each problem the choice of a randomly determined stimulus is rewarded until each new problem is solved after a single presentation. Restle (1962) and Levine (1963) explain the formation of learning sets in primates as due to symbolic (i.e. mediating) processes.

Bibliography: Bruner, J. S.: *The process of education*, New York, 1960. Harlow, H. F.: The formation of learning sets. *Psychol. Rev.*, 1949, 56, 51-65. Levine, M.: Mediating processes in humans at the outset of discrimination learning. *Psychol. Rev.*, 1963, 70, 254-76. Restle, R.: The selection of strategies in cue learning. *Psychol. Rev.*, 1962, 69, 329-43. *H.G.*

Learning theory. The term "learning theory" is misleading inasmuch as theories of learning are not concerned exclusively with the explanation and systematic representation of the learning processes, but are more or less general theories of *behavior*, which merely happen to start out from the common assumption that the environmental influences operative in learning processes are of major importance for our understanding of the ways in which the individual adapts to his environment. The first attempts to define learning theories of this kind coincided with the beginning of experimental learning research. Even though knowledge of the empirical

conditions of the learning process was not immense, it was nevertheless assumed that the laws of imprinting and memory (q.v.) were known: the laws of association (q.v.) described the mechanisms of content association, and Darwin's theory of evolution (see *Darwinism*) seemed a useful model for the development of new modes of behavior. Just as the evolution of species could be explained as the result of selection and mutation, so, by elucidating the conditions for behavioral selection, the learning process could be interpreted as the result of a selection process.

Since the ideas governing the first learning experiments (Ebbinghaus, 1885; Thorndike, 1898) were considerably influenced by this primitive conception of learning mechanisms, it was possible to view the success of such experiments as justifying those presumptions. This was of decisive significance for the future development of the psychology of learning.

"Classical" learning theory includes several groups:

1. *S-R theories*. These share the assumption that learning consists of an association of stimuli (S) and responses (R). According to the type of additional mechanisms postulated, there are S-R reinforcement and S-R contiguity theories.

(a) *S-R reinforcement theories*. (i) E. L. Thorndike's connectionism (Thorndike, 1913; 1932): If the organism is placed in a problem situation, it will react to that situation (because of its instinctive equipment or previously acquired behavior patterns) in the way possible to it, until one of its responses happens (i.e. by chance) to have a successful outcome (trial-and-error behavior). In certain circumstances there is a greater probability that prominent features of the situation will be taken into account, thus making possible solutions characterized as "insightful" behavior, even though they do not occur through "insight" (the principle of crucial aspects, or the acquisition of *distinctiveness of cues*). New (behavioral) habits are formed on the basis of the connection of *situation*

(situational characteristics) and *response(s)* if this association is directly followed by a "satisfying state of affairs" which causes its intensity to increase and hence the probability that on the next similar occasion the appropriate behavior will occur again (see *Effect, law of*). Negative consequences of behavior (an "annoying state of affairs") which accompany the connection of situation and response after only a short time interval reduce the probability of the recurrence of the response in question. Even though Thorndike originally (1913) attributed this to a diminution of associative intensity, he later (1932) discarded this explanation, without of course depriving the law of effect of its central position among other "laws" and principles of learning (law of exercise, law of readiness; the principles of belongingness, impressiveness, availability, etc.). Although most learning theories comprise "principles of effect" (and thus selection criteria for the impression of behavior patterns), there is, as Postman (1947) pointed out, the danger of a circular argument: if the eventual gratifying state of affairs is understood as a set of conditions in which the animal does not undertake anything in order to avoid it, but is often concerned to achieve or maintain it (Thorndike, 1913), the law means only that the animal *does what it does because it does it*. (See Thorndike, E. L.; *Habit*.)

(ii) C. L. Hull's systematic theory of behavior is in some respects related to Thorndike's ideas, and represents the first sequacious attempt to derive empirically testable propositions from a series of general assumptions (hypothetico-deductive method), and thus to achieve a proficient theory (Hull, 1943). In its most recent version (Hull, 1952), the system is divided into seventeen postulates and seventeen corollaries (not usually, however, directly derived from the postulates) expressed verbally and in the form of equations. In addition there are one hundred and thirty-three theorems concerning observable facts. Despite the system's complexity, it depends on a few independent and dependent variables, and a few intervening

variables which are functionally associated with the two preceding categories of variables but are not directly observable. Among the independent variables are: stimuli (S), which are treated in principle as physically determinable quantities; the number (N) of reinforcements to date, i.e. the need-reductive consequences of a certain response (see *Reinforcement*). The dependent variables and hence measures of the learning process are: response (reaction) latency ($S^T R$), response amplitude (A) and response frequency (n). Then there are the most important intervening variables: habit strength ($S^H R$), drive (i.e. physiological strength of drive) (D), reactive inhibition (I_R), conditioned inhibition ($S^I R$), and response (reaction) potential ($S^E R$) and inhibitory potential ($S^I R$). Within the system (in addition to assertions about primary and secondary motivation, secondary reinforcement, the arrangement of response potential, the mechanism of inhibition, and such conditions as stimulus and response generalization) the following postulates are especially important:

Postulate 3: Primary reinforcement: if a response (R) is closely associated with a stimulus trace (s) and the stimulus-response connection is associated with a sudden decrease in drive stimulus (S_D), the tendency of this stimulus trace(s) to release that response (R) will increase. *Postulate 4:* Habit strength ($S^H R$) as a function of reinforcement: habit strength (the tendency of a stimulus trace to release an associated response) grows as a rising, negatively accelerated function of the number of trials, given that the trials are evenly distributed, that each is reinforced, and that all other conditions remain constant.

Hull makes the "fractional antedating goal response" responsible for integration of the individual responses (learnt in isolation); through the r_G , new (proprioceptive) stimuli (S_G) are produced simultaneously. These self-produced stimuli form not only the basis for the habit-family hierarchy but also offer a possibility of explaining cognitive processes without recourse to additional assumptions

(Hull, 1952). C. E. Osgood's (1954) mediation theory is especially significant in this regard in adducing the r_G - S_G mechanism to explain the genesis of meanings.

(b) *S-R contiguity theory*. Against the background of Pavlov's (1928) physiological and J. B. Watson's (1914) "behavioristic" approaches, E. R. Guthrie (1952) conceived a theory of *instrumental learning* in which the reinforcement of an S-R connection played only a secondary role. A combination of stimuli which took effect at the same time as a movement, will tend on recurrence to be followed by that movement (Guthrie, 1952), in which case the stimulus pattern has its full associative strength even on its first association with the response. The fact that learning curves (q.v.) show a gradual increase leads Guthrie back to the complexity of the observed actions (from which the individual movements to be learned are no longer derivable). The significance of reinforcement resides exclusively in its capacity of *interruption*: since it brings the trial to an end, it prevents the formation of new S-R bonds after the last, i.e. successful, movements.

2. *Classical conditioning theory*. This theory was originally conceived by Pavlov (1928) in order to explain the laws of movement of nervous processes which enable the conditional-reflexive activity of the brain to occur (Leontiev, 1961); despite its many neurophysiological references, this is essentially a learning theory. The adaptation of behavior to the environment occurs (according to Pavlov) on the basis of the acquisition of conditioned reflexes. As a result of repeated temporal contingency between neutral stimuli (conditional stimuli) and unconditioned reflex releasers (unconditioned stimuli), the organism also begins to react to those stimuli without any intrinsic biological significance (Leontiev, 1961). Hence they become first order signals. On the basis of the same physiological mechanisms, a second system of "signals of signals" can be formed (see *Language*) which represents an "abstraction from reality" (Pavlov, 1928). The orienting

reflex (q.v.), which controls orientation to new objects, plays an especially important part in the adaptation process. The occurrence and interaction of complexes of cortical excitation are countered by central inhibition processes (see *Inhibition*), whereby the external inhibition is produced in that, simultaneously and during the operation of any (one) center, some other center is activated by the stimulation of other afferent nerves or by some other automatic stimulation (Pavlov, 1928). As against this, inner inhibition is directly attributed to inhibitory physiological accompaniments of the innervation process. As in the case of generalization of conditioned stimuli (irradiation of excitation), an inhibitory irradiation, i.e. an extension of the inhibition to considerable areas of the cortex, is also possible.

3. *Theory of operative conditioning.* In B. F. Skinner's "descriptive" learning theory (1938), as for Thorndike (q.v.), Hull (q.v.) and Pavlov (q.v.), reinforcement is of major importance, yet Skinner does not attribute it to specific mechanisms. Every aspect of the environment which may be said to influence behavior is a possible reinforcer. If the learning process depends on a (reinforced) association of stimuli and the responses released by them, Skinner refers to *type S conditioning*. Nevertheless, more importance is attached to changes in the probability of the class of behaviors (operants) for which no releasing stimuli can be identified. This operative (operant) conditioning (*type R conditioning*) obeys (*inter alia*) the following law: if the occurrence of an operant is followed by the presentation of a reinforcing stimulus, its strength is increased (Skinner, 1938). In this way a specific action potential is formed which ordains, e.g. how often and at what speed the action will be performed in future, in which case individual stimuli can assume a controlling function. The principle of operant conditioning also permits the treatment of complex adaptation processes, such as *shaping of behavior*. See *Behaviorism; Conditioning, classical and operant*.

4. *Cognitive learning theories.* This group includes several distinctive approaches which share above all a critical attitude to all S-R models and an emphasis on perception and representation processes. E. C. Tolman's "purposive behaviorism", for instance, has won acknowledgement as a learning theory. In his perspective, every situation is divided up for the organism by diverse signs which *significate* the way to specific goals or goal objects. The *sign* and *signified* are related spatially (*sign-gestalt*). If the organism possesses no specific sign-gestalt for a given situation, *expectations* are aroused. These are to be understood not as conscious anticipations but as sign-gestalts formed in earlier, similar situations. According to whether the route taken on the basis of expectation leads to the goal or not, the expectation and therefore (indirectly) the behavior are confirmed. In this way, when the situation recurs there is an increased tendency to strive toward the goal with the same class of behaviors.

5. *More recent theories.* Current theories afford a hardly more unified picture, although the inclusive theories of behavior have been replaced by *models* with less totalitarian claims to validity. Significantly, these new theories are no longer advertised as "learning theories". Apart from the attempts to modify and extend older systematic approaches (e.g. Anokhin's treatment of classical conditioning theory, 1969, etc.), theoretical efforts in the learning field are at present characterized by: restriction to a systematic treatment of part-areas, as, e.g., in "miniature" models (e.g. paired-associate learning: Bower, 1962); a tendency to an increased formalization of approaches, whether in the form of probabilistic learning models (Atkinson & Estes, 1963), or as attempts to simulate learning processes (Feigenbaum, 1963); and more consideration of hitherto neglected or inadequately examined learning mechanisms: examples in this regard are recent theoretical approaches to the phenomenon of social learning (Bandura & Walters, 1967; see *Socialization*), but also the more intensive interest in

memory (q.v.) processes proper. It is impossible to say as yet to what extent the development of learning theory will be determined by progress in applied learning research (in connection with behavior therapy, q.v., instructional technology, q.v., etc.). A solution of the basic problems of learning theory (Foppa, 1965) seems as little to be hoped for from this source as from a greater formalization of propositions (Foppa, 1967). It is still an open question whether approaches to date adequately represent and explain human adaptation processes. See *Learning; Behaviorism; Conditioning; Reinforcement; Soviet psychology*.

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intelligence. New York, 1911. Id.: The psychology of learning. Educational psychology, Vol. 2. 1913. Id.: The fundamentals of learning. New York, 1932. Watson, J. B.: Behavior. An introduction to comparative psychology. New York, 1914. Young, J. Z.: The memory system of the brain. London, 1966.

K. Foppa

Learning, trial-and-error. In situations for which no (instinctive or acquired) behaviors are at hand, activated (aroused) individuals exhibit an extremely variable, apparently undirected and random behavior. If a behavior or a sequence ultimately results in success, in successive trials this behavior gradually occurs more quickly until finally it appears immediately in the appropriate situation. Such a behavior is said to have been learnt through trial and error.

Experiments in this regard have been conducted since about 1900 using puzzle boxes and (later) mazes. The observed behavior patterns were interpreted as meaning that neither insight nor goal-directed behavior was necessary in problem situations. Learning could be explained (so it was said) by the gradual extinction of ineffective, and reinforcement by effective, behaviors (see *Effect, law of*). See *Behaviorism; Conditioning, classical and operant*.

F.M.

Learning types. The categories used to classify learners according to readiness or a specific learning method. Everyday usage divides people into “good” and “poor” (or “bad”) learners, in the sense of a relatively constant relationship between application (practice, q.v.) and successful learning.

H.S.

Learning, verbal. The learning of verbal material by (usually) voluntary practice and memorizing. In retention testing, S. should respond to the verbal stimulus with the appropriate verbal behavior. The basis of verbal learning is that displayed in Ebbinghaus’ (q.v.) classical experiment. It

extends from the associative learning of two nonsense syllables to the learning by insight of the solutions to (verbally posed) complex problems. *F.-C.S.*

Learning while asleep. It was reported after a series of investigations that the presentation of (for the most part) verbal material during sleep led to successful learning. There are difficulties of method in that sleep is not defined uniformly, and that its depth is not easily measured. (See *Memory; Sleep.*)

Bibliography: Lewis, S. A.: Learning while asleep. Bull. Brit. Psychol. Soc., 1968, 21, 23-6. *F.M.*

Least perceptible difference (syn. *Threshold difference*). That difference in the intensity of two stimuli necessary in order to produce the least possible change in sensation. *P.S.*

Le Bon, Gustave. B. 7/5/1841 in Nogent-le-Rotrou, France; d. 15/12/1931, in Paris. Le Bon was a boy during the French Revolution of 1848 and when Napoleon III came to power. As a man in his early prime, he encountered the Paris Commune of 1871. He was forty-five when Boulanger almost took over the government of France. During the war of 1914-1918 he was an aged but still prolific writer. Between these latter crises, in 1895, he produced *The Crowd*, his *chef d'oeuvre*, which deals with broader issues of conformity, alienation, leadership, as well as with crowds in the strict sense. This work typifies Le Bon's position: he was powerfully influential, on sociologists, and psychologists from Freud downward, but remains something of a tragedy in the history of thought. He is remembered for his later social-psychological works. In these, especially those on World War I and the subsequent turmoil, his fertility and ingenuity of thought, ability to apply wide generalizations to particular problems,

sensitivity in problem-finding (though his solutions were sometimes crass) are vitiated by intellectual *voltes-faces*, prejudiced conceptualization, and disjointedness of style. *The Crowd* embodies Le Bon's basic social doctrine: that in crowds the individual may rise to heights or (more usually) fall to depths of action impossible for him in isolation. The crowd is impulsive, mobile, irritable, suggestible, credulous, possessed of exaggerated and ingenuous sentiments, intolerant and dictatorial. Underlying these characteristics are the general doctrines that human action is dominated by unconscious impulses, which are irrational; and that ideas shape institutions, not the reverse. This socio-psychological contribution emerges from a previous multiphased career, in which Le Bon traveled widely, contributed to anthropology (including archeology), researched on matter and energy, developed recording instruments, and produced a substantial experimental work on equitation. Perhaps his work on variations in cranial capacity by races is the key to his development. As he aged, Le Bon became addicted to the ordering of humanity by hierarchies of races, sexes, intelligence levels, and political standpoints. Broadly speaking, as hierarchy takes over, precision and balance weaken, and the notion of race, "historically" and imprecisely conceived, appears to permeate his thought. On the "Anglo-Saxon" race Le Bon committed one of his major *voltes-faces*; but this and other aberrations should not obscure his real inventiveness and intellectual power. See *Crowd behavior*.

Main works: *La psychologie des foules*. Paris, 1895. *La révolution française et la psychologie des révolutions*. Paris, 1912. (Eng. trans.: *The psychology of revolutions*. London, 1913). *Aphorismes du temps présent*. Paris, 1913.

Bibliography: Merton, R. H.: The ambivalences of Le Bon's *The Crowd*. In: Le Bon, G. (Trans.) *The crowd: a study of the popular mind*. New York, 1960, v-xxxix. Stoetzel, J.: Le Bon, Gustave. Int. Encyc. Soc. Sci. New York, 1968, Vol. 9, 82-4. *J.A.C.*

Lee effect. Impaired vocalization resulting from delayed acoustic feedback.

Bibliography: Lee, B. S.: Effects of delayed feedback. *J. Acoust. Soc. America*, 1950, 22. *K.E.P.*

Left-handedness. The preferential use of the left hand (dominance of the right half of the brain). A number of eminent men (e.g. Leonardo da Vinci) have been left-handed. A distinction is made between inherited and acquired left-handedness (e.g. encephalitis, q.v.). The degree of left-handedness is important for educational measures. If it is highly pronounced, attempts to induce the individual to "become right-handed" can result in, above all, disturbed speech and dyslexic manifestations which can in many cases be attributed to mixed dominance (the eye and hand are dominated by different halves of the brain). See *Laterality*. *H.Ma.*

Legal judgment, psychology of. One branch of forensic psychology (q.v.) concerned with external influences on, and inner phenomena and impulses operative in all human action, thinking and emotion, which may affect legal judgment. Investigations into behavior relating to legal decisions have to take into account the psychodynamics of the legal process, the personality traits and attitudes of the judge or jury, and the nature of judgments. (See *Decision processes*; *Attitude*; *Prejudice*.) Every legal judgment brings into play the social, political, cultural and vocational suasions that can affect human thought and sensitivity. Factors of place and time play a significant part. Personal experiences and impressions and their psychological correlates can affect the process. The particular mood or emotional state of a judge can modulate a decision. One vital part-concern of psychology should be to make judges, magistrates, etc., aware of the manifold extra-legal factors that can influence their decisions, and to help them to bring them under rational control. One important aim

would be to exclude (by psychodiagnostic techniques) judges whose personality traits made them unsuitable, and to provide a psychological training program that would enable those exercising judgment to serve the community more effectively.

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Leipzig school. A group of psychologists including Krueger, Sander, Klemm, Volkelt and Wellek. They are sometimes referred to as "*Ganzheit*" (q.v.) psychologists to distinguish them from the "gestalt" psychologists of Berlin. *C.D.F.*

Leiter International Performance Scale. A series of "culture-free" intelligence tests (q.v.) in which local or national instruction plays as small a part as possible. The series includes picture completion, matching, analogies, discrimination tests, etc., and are available in grades from two to eighteen years. Performance is expressed in terms of mental age and IQ.

Bibliography: Leiter, R. G.: The Leiter International Performance Scale. Santa Barbara, Calif., 1940. *F.G.*

Leniency effect. A systematic error of judgment resulting from social tendencies to leniency and broadmindedness. Especially in personality assessment and rating, those exhibiting the effect tend to assess known or sympathetic individuals more favorably than less well-known or unsympathetic individuals. In the self-critical, the opposite tendency is usually to the fore. There is in most cases an additional tendency to judge favorably ("generosity error"; Cronbach, 1960).

Bibliography: Cronbach, L. J.: Essentials of psychological testing. New York, 1960. Guilford, J. P.: Psychometric methods. New York, 1954. *K.E.P.*

Lens. The lens of the eye is a biconvex, circular, transparent structure of (in the adult) approximately 1 cm diameter and 4 mm central thickness. The equator, or edge, of the lens is encircled by a number of sacculated zonular spaces, or lymph spaces, lying behind the suspensory ligaments (the zonule). The lens is situated between the iris (q.v.) and the pupil, in the hyaloid fossa on the anterior surface of the vitreous body. The curvature of the lens is varied by the ciliary muscles. The radius reduction (on contraction of the smooth muscle fibers of the ciliary muscle) of the anterior surface of the lens (in the young from about 10 to 6 mm) can be measured with an optometer. It increases refractive power and objects near to the eye are sharply imaged on the retina (q.v.) (see *Accommodation*). When constriction of the ciliary muscle is relaxed, the lens is restored to an unaccommodated condition: i.e. refractive power is diminished, producing sharp focusing of more distant objects. The refractive difference of the lens between maximal accommodation and a fully unaccommodated eye is for young persons 12 to 14 diopters; in the aged, reduced elasticity of the lens brings the accommodative mechanism to a standstill. This physiological process due to senile change produces presbyopia (q.v.) and a near point receding to infinity. *Cataract*, or opacity of the lens due in most cases to senile degeneration, can be improved by surgery and special spectacles (+12 diopters) which compensate the lost refractive power. Recently some success has been reported in the implantation of false lenses made from a material similar to plexiglass. Glass, plexiglass lenses, etc., can also be used, e.g. as spectacles in order to improve ametropic conditions (see *Ametropia*). See *Eye*; *Sense organs*: the eye; *Visual perception*. K.H.P.

Leptomorph(ic). See *Body-build*.

Leptosome (syn. *Leptosomic*, *leptosomatic type*). The leptosome is one of the body-build

types or physiques described by E. Kretschmer (q.v.), and is characterized by slenderness, small shoulders, thin arms, fine hands and a long, small, flat chest. The type is frequently met with among the schizophrenic psychoses; among normal individuals the leptosomic physique tends to accompany a schizoid (q.v.) temperament. See *Psychoses, functional*; *Type*. W.Se.

Lesbianism. Homosexuality (q.v.) among women. Females with homosexual experiences tend on the whole to change partners less than homosexual men do. Lesbianism is tolerated in almost all societies; even in those with anti-homosexual legislation, female homosexuality is rarely punished.

Lesbianism would seem to be more widespread among students than among other females, and is more frequently met with in artistic pursuits and in those requiring dominant behavior (Gebhard, 1968). The sexual and psychosexual behavior of lesbians approximates that of heterosexual women: only a few constantly exhibit pseudomascu-line behavior patterns and clothing. Most lesbians behave in a pseudomascu-line manner only for a short time and experimentally, and tend to conceive their experiences according to heterosexual models (the "butch", or dominant partner; the "fem", or passive partner; although there is frequently an exchange of roles). There is often (in certain societies and circles) permanent anxiety about discovery of and social discrimination against the deviation.

The causes of lesbianism are as yet inadequately researched, but it may be asserted that only in very few cases have specific sexual experiences led to the deviation. Some hypothesize unfavorable environment and disturbed family life as influencing the tendency (Simon & Gagnon, 1970). Biological hypotheses cite physical, genetic and hormonal "errors" as determinative, although research findings to date do not support the assumption that homosexual women can be

distinguished from the heterosexual by such criteria.

Bibliography: Woolf, C.: *Love among women*. London, 1971. Simon, W. & Gagnon, J. H.: *Sexuelle Aussenseiter*. Hamburg, 1970. See also: *Homosexuality*. H.M.

Le Senne('s) types. A characterology based on the fundamental traits of emotionality, activity and reaction time, and extending the system developed by G. Heymans and E. Wiersma: nervous, sentimental, choleric, passionate, sanguine, phlegmatic, amorphous, apathetic.

Bibliography: Le Senne, R.: *Traité de caractérologie*. Paris, 1952. W.K.

Lesion. A disturbance of the function of any part of the body; organic brain damage; an injury. F.-C.S.

Lethality; lethal factors. *Lethality*: a genetic abnormality causing the death of an organism, occurring in a homozygotism of most dominant mutations. *Lethal factors* (or lethal genes): alleles (q.v.) causing death in homozygous conditions, whereas in heterozygotes development can be impaired. *Lethal mutations* allow insight into the operation of genes (q.v.). In sickle-cell anemia in humans most of the red blood cells are sickle-shaped: homozygous children die early, heterozygous children are healthy and also resistant to malaria. Many lethal factors of drosophilia are caused by chromosomal mutations, such as deletion, inversion and translocations.

Bibliography: Hadorn, E.: *Letalfaktoren*. Stuttgart, 1955. K.Fi.

Leucotomy. See *Lobotomy*.

Leveling law. Formulated and experimentally established by W. Moede, the law states that where workers perform the same task on a

collective basis there is a tendency (based on "solidarity") for output to level out. Extremes tend to be eliminated while the overall group level shows a slight rise. The law does not operate in certain sociopsychological situations (e.g. in the presence of envy or rivalry within the group [see *Group dynamics*] or unusual conditions on the labor market, such as widespread unemployment). G.R.W.M.

Level, psychophysical. According to Köhler (1920) that area of the CNS (still to be exactly mapped out) in which the physiological processes forming the immediate correlate of the contents of consciousness occur. For example, in the course of a perceptual process, events in the terminal section of the cortex are accompanied by consciousness, but not those occurring in the sense organ and the conducting paths, which lie outside the psychophysical level.

Bibliography: Köhler, W.: *Die physischen Gestalten in Ruhe und im stationären Zustand*. Brunswick, 1920. P.T.

Level-related terminology. The performance of isolated acts or a complex sequence of acts corresponding to the different levels of the instinct (q.v.) hierarchy can be brought about by electrical brain stimulation. The effects triggered off depend on stimulus parameters, the point at which the stimulus is applied, and the basic mood of the test animal, as well as on external factors. In designating the stimulus-induced behavioral elements, exact knowledge of the behavioral inventory is necessary for ethologically accurate interpretation.

Bibliography: Holst, E. v.: *Zur Verhaltensphysiologie bei Tieren und Menschen*. Ges. Abh. I, 1969. K.Fi.

Levitation. Paranormal raising of an object or person; usually associated with physical mediumship. See *Medium*. J.B.

Lewin, Kurt. B. 9/9/1890 in Mogilno (Posen); d. 12/2/1947 in Newtonville, Mass. Lewin is remembered conceptually for his contrast of Galilean and Aristotelian psychology, field theory, topology-plus-hodology, and life-space; practically as an elucidator of culture-change, conflict (small- and large-scale), morale and minority-problems; generally as an integrator of theory and practice, and an inspiration on an unusually large scale to students who developed and applied his programs. Practically, Lewin's career was disjointed by the Nazi take-over; intellectually it was a coherent development in phases, which were expressions of the progress of his thought on basic problems. Academically, Lewin "habilitated" himself at the University of Berlin (Ph.D. 1914), following on work at Freiburg and Munich. In Berlin he taught 1921–1933. In the USA, from 1933, he held various visiting appointments, with two major permanent positions: Professor of Child Psychology at the State University of Iowa Child Welfare Research Station (1935–1945), and founder of the Research Center for Group Dynamics at the Massachusetts Institute of Technology. He became interested in motivation about 1914, working from associative bonds to intention, expectation, substitution (of tasks), and satiation. Gestalt theory he found inadequate, and developed *field theory*, the view (broadly) that events are determined by forces acting in the immediate field. Goal-seeking behavior is seen as locomotion symbolic or behavioral in a psychological life-space, (all the events that determine an individual's behavior at a time), more or less structured, the effects of motivation being represented by vectors and forces, while the data as a whole are ordered by *topology* (non-metrical geometry, with concepts inside, outside and boundary), while the direction of behavior in particular is handled through *hodology*, the science of paths. The application of these basic concepts, e.g. to conflict in marriage (1948, 84–102), and to post-war reconstruction (1948, 43–55) is the skeleton of Lewin's development from (broadly)

motivation to group-behavior to social control. His major theoretical achievements were his stress on the Galilean as opposed to the Aristotelian approach (concern with function, not structure or content) in psychology, on the "two-facedness" of conceptualization (rigorous description but broad theoretical constructs), the transcending of the boundaries of the social sciences, and the use of mathematical tools in building systematic psychology. His importance is attested by the number of workers still active in developing his thought.

Main works: A dynamic theory of personality. New York, 1935. Principles of topological psychology. New York, 1936. Resolving social conflicts. New York, 1948. (G. W. Lewin, Ed., Papers dated 1935–1946.) Field theory in social science. New York, 1951. (Cartwright, D., Ed., Papers dated 1939–1947.)

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Libido. According to Freud (q.v.), the sexual energy by means of which erogenous body areas arouse an individual to search for pleasure. In psychiatry, libido is often conceived more specifically as the totality and the degree of an individual's genital or love interests. Freud (1929) includes among these the pregenital interests, i.e. oral needs and the anal interests of manipulation. Libido development occurs (according to Freud) in distinct stages (see *Oral*, *Anal* and *Genital stage*). Psychic illnesses are seen as disturbances of libido development and as regressions to earlier, disturbed phases (see *Regression*; *Energy*, *mental*). According to Jung (q.v.) (1966), libido may be conceived according to the Freudian pattern but can also be desexualized. Freud, too, but above all some

of his disciples (e.g. Hartmann, 1959), speak of the "neutralization" of libidinal (libidinous)—and aggressive—psychic energy. According to Toman (1960) in question here are forms of gratification of motives which are no longer sought as a function of the specific intensities of such motives (i.e. no longer for their specific value as gratification), but on account of their value for the more direct satisfaction of other motives.

Bibliography: Abraham, K.: Selected papers on psychoanalysis. London, 1927. Freud, S.: Introductory lectures on psycho-analysis. London, 1929. Hartmann, H.: Ego psychology and the problem of adaptation. London, 1959. Jung, C. G.: Symbols of transformation (Collected works, Vol. 5). Princeton & London, 1966. Toman, W.: An introduction to psychoanalytic theory of motivation. London & New York, 1960.

W.T.

Lie detectors. Polygraphs (q.v.) used in an attempt to record physiological reactions to critical questions. Findings thus obtained possess only a limited validity and objectivity, which depend to a large extent on the interrogator and the interrogation (q.v.) technique used.

P.Z.

Lie scales. Many inventories contain built-in lie tests, designed to detect testees' tendency to falsify. Appropriate items usually contain questions or statements on socially unacceptable behaviors, which are formed so as to assume that such activities are universal. The validity (q.v.) of lie tests is difficult to check.

G.L.

Life, course of. See *Life history*; *Case history method*.

Life, forms of (Ger. *Lebensformen*). 1. Typical individual modes of life within a specific area or framework, which are correlated with the structure of the environment. 2. According to Spranger (1966), human *ideal types* more or less intensely displaying existing cultural values. Depending upon the predominant

values, Spranger distinguishes theoretical, economic, esthetic, social, religious and power forms of life, or types of men.

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W.K.

Life history (syn. *Study of course of life*; *Life cycle analysis*). A life history is a study of the life cycle, or a psychological account of the course of human life. The first attempt at such a study was made by C. Bühler in 1933. Distinctions were made between behavior and events, inner experiences and products of the course of human life. These were examined on the one hand in their interrelations, and on the other in relation to the process of physical maturation and development. Bühler distinguished *five stages* of the physical as well as the psychological process and examined various life cycle structures. Some basic theoretical assumptions were arrived at: that human life is lived with an *intentionality* that gives it direction; that men define themselves; that they are conscious not only of needs but of "tasks"; and that they wish to realize certain objectives. At approximately the same time psychoanalysts began to carry out investigations into courses of human life (see *Psychoanalysis*). Even in 1910, Freud (q.v.) published a study of Leonardo da Vinci in which he asserted the basic goal of the psychoanalytic biographical method of that time as the elucidation of the relationship between external experiences and individual reactions. In a critical report published in 1970, R. Ekstein pointed out that the biographies in the psychoanalytical literature of that time were viewed from the restricted angle of clinical theory. In modern "ego psychology" the course of life is seen as the realization of certain elective tasks, which Erikson presents in eight stages as crises of identity of human self-development (e.g. 1959).

A third kind of life study is sociologically oriented; the main representative of this

school is Havighurst (1963). He sees development in the realization of developmental tasks, which result in part from the personal values and strivings of the individual, and in part from the cultural influence of society.

A fourth kind is the behavioristic and statistical method of describing a course of life, whose main representatives were at first S. C. Pressey and R. G. Kuhlén (1957). It has been more systematically and profoundly applied by Thomae (1968) in a volume containing additional studies by U. Lehr. Thomae describes the individual in an "undistorted" and "theoretically undiminished or predetermined form" (p. 103).

The fifth kind of life cycle study is the humanistic-psychological approach, as presented by Bühler (1968) in a new version of her original approach (see *Humanistic psychology*, II; *Case history method*).

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C. Bühler

Life instinct. Largely synonymous with psychic or mental energy and libido (q.v.). Freud conceives the life instinct as the drive toward gratification of wishes and motives, as the striving for pleasure, and as the energy behind all human (and animal) behavior. At first Freud made a distinction between the life instinct and the instinct of self-preservation, and later between the life and the death instinct. Apart from its significance in differential psychology, the term is psychologically redundant. In a sense of differential psychology, various degrees of life instinct seem more than anything to accord with diverse degrees of vitality or drive (q.v.) in a particular individual. See *Energy, psychic*.

Bibliography: Freud, S.: *Beyond the pleasure principle*. London, 1919.

W.T.

Life plan. In the individual psychology (q.v.) of Adler (q.v.), this is the structure of wholly or to some extent unconscious guiding lines which determine the individual's behavior.

W.Sch.

Life space (syn. *Living space*; Ger. *Lebensraum*). Numerous creatures defend a restricted living space, or territory, by which they subsist. However, the findings of ethnographic field research do not support the assertion of a human "territorial imperative" (R. Ardrey), i.e. the instinct (q.v.) to conquer a territory. In Lewin's topological psychology (q.v.), life space is the "field" within which individual behavior occurs and by whose positive or negative valence (q.v.) it is influenced.

W.Sch.

Light. The specific stimulus for the sense of sight (see *Sense organs*: the eye). Conceived more restrictively, light is electromagnetic radiation in the range of approximately 380–760 nm (nm = nanometer, 10^{-9} m), as evaluated by the photoreceptors (see *Cones*; *Rods*). Photometry is the study of light and light measurement. See *Brightness*; *Glare*; *Visual perception*.

A.Ha.

Light adaptation. Reduction in the sensitivity of the visual system to light intensity when the environment (visual field) alters spontaneously or through artificial intervention from a low to a higher level of light intensity. While the sensitivity to light intensity falls off, sensitivity to contrast, acuity, color differences, etc., rises: i.e. when the sensitivity to light intensity falls off, the capacity of the visual system improves. Opposite process: *Dark adaptation*.

A.Ha.

Lighting. Lighting is an applied discipline concerned with modes of illumination and the uses of lights, lamps, lighting systems, etc., indoors and outdoors. The method used is lighting calculation (lighting instructions derived from photometric measurements and

basic knowledge of the physiology of the senses, psychophysics and psychology). Distinctions are drawn between *outdoor* or *exterior* lighting (street lighting, flood lighting, installations at sports grounds, urban lighting, and the illumination of objects, e.g. monuments, etc.), *indoor* or *interior* lighting (dwellings, places of employment, factory shops, retail stores, stages, etc.), and lighting for advertising, or with some special effect or purpose in view, etc. See *Glare*; *Sense organs*: the eye; *Visual perception*. A.H.

Likert scale. A scale giving values for individual reactive attitudes. The testee is required to choose from (at the most five) possible answers per item and thus to show his degree of agreement or disagreement with the attitudes represented. See *Attitude*.

Bibliography: Likert, R.: A technique for the measurement of attitudes. *Arch. Psychol.*, 1932, *140*, 1-55.

W.H.B.

Limitation of consciousness. Limitation of the number of conscious contents which can be experienced clearly and simultaneously (approximately 6+2 elements in the case of simple contents of perception). See *Consciousness*; *Arousal*. K.E.P.

Limits, fiducial. The limit points on either side of a representative statistic (q.v.) giving the width of variation of the statistic on either side of the mean for given probabilities. The distance between these points is known as the *fiducial*, or *confidence, interval*. The given probability is usually $p = 0.05$ or 0.01 .

D.W.E.

Limits method. A psychophysical method (see *Psychophysics*) for determining absolute thresholds and differential thresholds. Students of G. T. Fechner (q.v.) also use the term *just-noticeable-difference method*. In the limits method, the experimenter proposes to change the stimulus. In doing so he starts from a different stimulus magnitude than the one he

wants. In determining absolute thresholds, the testee either says when he perceives the stimulus, or when he no longer perceives it. To determine differential thresholds, the testee says when he can find no difference between the changing stimulus and a comparative stimulus. F.M.

Limit value. If, for a given series $a_1, a_2 \dots a_n \dots$, there is a number A to which the terms a_n approximate as n increases, this number A is called the *limit value of the series*

$$A = \lim_{n \rightarrow \infty} a_n.$$

W.H.B.

Lincoln-Oseretzky Development Scale. See *Oseretzky test*.

Linear correlation. Relations between two or more variables are linear if they correspond to the linear equation $Y = a + bX$. Linear relations form a prerequisite for the use of some bivariate parametric methods. See *Product-moment correlation*; *Analysis of variance*. G.Mi.

Linear space (syn. *Euclidean space*). In contrast to *Riemannian space*, which is "curved", and a four-dimensional space-time continuum, linear space is that to which Euclidean straight-line geometry applies: this simple, "flat" space occurs in Einstein's special theory of relativity, whereas the general theory depends on "curved" space, and a "closed" rather than an "open" universe.

Linguistics. See *Psycholinguistics*; *Language*; *Grammar*; *Verbal behavior*.

Link Trainer (syn. *Link Instrument Trainer*). A practice chamber used mainly for pilot training, in which various flying conditions and disturbances can be simulated which the

trainees have to compensate by appropriate actions.

K.D.N.

Lip key. A device hardly used today and intended to measure reaction times in lip movements during speech. The opening or closure of the lips closes or breaks a circuit (with the aid of two contact strips) and controls a time meter. A sound hammer and similar devices are generally employed for such purposes.

A.Th.

Lipp's illusion. One of the geometric illusions. The parallelism of main diagonals is difficult to perceive through the effect of the varying directions of lines at their ends.

C.D.F.

Lipps, Theodor. B. 28/7/1851 at Wallhalben, Germany; d. 17/10/1914 in Munich. Philosopher and psychologist. Lipps was Professor at the Universities of Bonn (1877), Breslau (now Wroclaw, Poland) (1890) and Munich (1894). He tried to ground the basic disciplines of logic, esthetics and ethics and all psychological knowledge on the "principle of inner experience". He thought it was imperative to conceive psychology as a science of mental life and turned decisively against the application of natural-scientific methods in psychology. In order to explain the understanding of other individuals and objects as well as the comprehension of art, Lipps applied the principle of empathy (q.v.) (Ger. *Einfühlung*), which he took from the esthetician Vischer and conceived as the process of self-projection into an object of perception—for the most part by means of expressive phenomena (see *Expression*). See *Perception*; *Visual perception*.

Main works: *Grundtatsachen des Seelenlebens*. Leipzig, 1883. *Raumästhetik und geometrisch-optische Täuschungen*. Leipzig, 1897. *Leitfaden der Psychologie*. Leipzig, 1903. *Psychologische Untersuchungen*, 2 vols. Leipzig, 1907–12. *Ästhetik*, 2 vols. Leipzig, 1923.

W.W.

Liquor. Medical term for a fluid, especially a fluid drug. Some body fluids are also described thus. *Liquor amnii*: the amniotic fluid which collects in the fetal amnion-sac. The *liquor cerebrospinalis* is a lymph-like fluid filling the brain cavities, the subarachnoid space (space between the brain and the *dura mater*) and the spinal cord. The cerebrospinal fluid removes waste products from nerve cells and acts as a mobile buffer.

E.D.

Lisping. Speech impairment in which sibilants are inaccurately uttered or replaced by other sounds. Lisping results from the movement of the tongue against the upper row of teeth. Frequent causes are anomalously positioned teeth, which require appropriate orthopedic treatment of the jaw. See *Sigmatism*.

M.Sa.

Lissajou's figures. Figures resulting from the combination of two perpendicular oscillations on an oscilloscope. Lissajou figures afford information on the frequency relation and phase sequence of two individual oscillations.

Listing's law. One of the eye-movement laws. When the eye moves from the primary position, its rotatory movements occur about an axis which is perpendicular to the initial and final lines of regard of the eyeball. This means that tertiary positions are brought about not by a *sequence* of side and upward movements, but only by both types of movement occurring simultaneously.

K.H.P.

Literacy. The ability to read and/or write.

Literature and psychology. 1. *Psychology in literature.* Acknowledgements of psychology are so conventional in modern literature that Joyce's "They were young and easily freudened" is almost straightforward,

and Auden's "One rational voice is dumb; over a grave/The household of Impulse mourns one dearly loved" (*In Memory of Sigmund Freud*) more appropriate from a writer than Nabokov's "huge custard-colored balloon . . . inflated by Sigismond Lejoyeux, a local aeronaut" (*Speak Memory*).

The Zeno of Italo Svevo's *The Confessions of Zeno* (1923) writes an autobiographical exercise—but to show his psychiatrist is a charlatan in attributing his hypochondria to the Oedipus complex; he abandons the analysis when a physician tells him his real sickness is diabetes. Humbert Humbert begins *Lolita* (1955) in the "psychopathic ward for observation", yet Nabokov rejects "completely the vulgar, shabby, fundamentally medieval world of Freud". These two novels are correctives of a tendency to psychologism in twentieth-century literature, not because they disavow psychoanalytic methods but because they show clearly that "analysis" is only one of the interests that they arouse to produce the tension of ambiguities and possibilities peculiar to literary art, or (like sixteenth-century drama with its typology of humors) use as a *unifying principle*. There are, of course, many works of modern literature in which psychoanalysis (or the new interest in the permutations of supposedly innate myths) is put to literary ends: James Joyce's *Ulysses* (1922) and Hermann Hesse's *Steppenwolf* (1927) are examples of major fictions combining aspects of new, fashionable allegories and theories of consciousness with older introspective and associative techniques; yet the results are unique forms which cannot be reduced to a "nothing but . . .". Literary works in which the author relies wholly or largely on an untransmuted analytics appear increasingly banal as the theory becomes part of a chapter in the history of ideas.

When the insecure son in Arthur Miller's *Death of a Salesman* (1949) steals a fountain-pen, the "phallic symbolism" has a basic interpretative function in the drama that, say, Shakespeare's borrowings in *Macbeth* (1605)

from the iatrochymist Paracelsus (e.g. Duncan's "golden blood") do not have to sustain. Of course psychological theories must appear in time-conditioned works whose authors rely on a common world of intellectual discourse to communicate with their audience, and the first stirrings of scientific psychology can be traced in imaginative literature: e.g. in the fourth voyage of *Gulliver's Travels* (1726), Swift makes use of contemporary perception theory (Berkeley *et al.*) when Gulliver sees an island and the sorrel nag a blue cloud—yet the reference serves the larger end of the book's literary presentation of the relations between the "passions" and reason. A simplistic theory of heredity and environmental psychology gave Zola a framework for his Rougon-Macquart novels (1871–93), the ultimate literary effects of which make a virtue of the errors of his version of the *race, moment and milieu* formula. In Zola's case, too, despite the understandable stress on alcoholism and absence of any mention of, say, phenylketonuria, the popularity of his novels helped the climate in which the importance of the scientific investigation of heredity would be more widely appreciated. In some recent semi-popular fiction the methods of behavior analysis have received attention. In, e.g., Anthony Burgess's *A Clockwork Orange* (1962), Dr Brodsky and Dr Branom induce an aversion to violence (and Beethoven) in a young delinquent and thus make him the devitalized man-machine of the title. Although this book raises the issues of moral choice and of the desirability of effective correction of socially criminal or deviant behavior, the lack of *literary* resolution and the confused portrayal of the aims and methods satirized make it a less competent essay on the subject than novels of a traditional cast which do not even refer to the techniques (e.g. Solzhenitsyn's *Cancer Ward*, 1968; Orwell's *Nineteen Eighty-Four*, 1949). The most effective use of narrative fiction to *propagandize* a psychology (behaviorism, q.v.) is to be found in B. F. Skinner's *Walden Two* (1948).

Interest in human motivation and acquaintance with, and understanding of, varieties of human behavior (if only linguistic) are necessary attainments of a literary artist; in this general sense works are often assessed for "psychological" proficiency. One might describe Benjamin Constant's *Adolphe* (1816), Swinburne's *Lesbia Brandon* (1860), Dostoevsky's *Crime and Punishment* (1866), Fedor Sologub's *The Little Demon* (1907), Proust's *A la Recherche du Temps Perdu* (1913–27), Hermann Broch's *The Bewitchment* (1935), Malcolm Lowry's *Under the Volcano* (1947) and Pinter's *The Caretaker* (1960)—all characterized repeatedly as "psychological"—as "about", respectively, emotional masochism, active and passive algolagnia, psychic conflict, persecution mania, homosexuality and the "death wish", mass hysteria, alcoholism, and electro-convulsive therapy; yet this is not all they are about. However detailed an author's observation of a disorder (Dostoevsky, e.g. has been shown to possess considerable knowledge of contemporary clinical psychology), it is conditioned by the *socio-historical symbolic* importance of an actual or imaginary disorder, and—above all—by the author's attempt to convey a certain ethos or to reach an artistic balance. An appropriate demonstration of how changes in science, etc., can affect the literary usage of a key psychological concept is Webster's history (1955) of the abstract noun *psyche* from Homer to the fifth century B.C.

As experimental psychology discovers more about the determinations of human personality and behavior, we may expect its insights to be *variously* imaged in literature, for literary art is essentially productive of improbability, of presemblance as well as semblance, and, by remaking it, constantly disputes the indisputable. It is not known whether greater enlightenment will produce greater literature.

2. *Psychology of literature.* The psychological investigation of literature has as its objects: (a) the writer's motivation; (b) the process of composition; (c) the thematic,

stylistic or (psycho)linguistic analysis of works in relation to the modes of their individual or social reception and their presumed or recorded effects; (d) the relation of literary taste to personality; and (e) the investigation of the educational and therapeutic uses of literature.

(a) An extreme view of any *writer's psychology* is Freud's qualification (1925) of artistic activity as *fantastic compensation* rather than as a valid "real-life" pursuit—a view which, as presented, would qualify a theorist in any discipline as abnormal (see also Stekel, 1923). Kretschmer (1931) categorizes creators of prose fictions as pyknics, and manic-depressive in tendency, and creators of poetic fictions as leptosomes, and schizophrenic in tendency. Jung (1928) does not put writers into one sole category of his typology, and allows of their products being expressive sometimes of their type, sometimes of their antitype. Still met with are variations on Ribot's postulate (1906): a polarity of writers as "plastic", externally perceptive types and "diffluent", auditory, self-expressive types. None of these categorizations is conclusive. (b) Among investigations of *literary composition*, that of Patrick (1935) into poetry-writing, using a group of poets and another of non-poets, subjected to the same pictorial stimulus, is interesting in its characterization of the process as a form of problem-solving (q.v.) activity. It cannot, of course, be claimed that the conditions of this study allow any valid generalization. In the USSR, Jagunkova (1964) made an extensive, highly differentiated, experimental study of students' "literary abilities"; she obtained *six factors* applicable to adults and adolescents: poetic perception of actuality, emotionality, above-average intelligence, observation, imagistic thought, large vocabulary (verbal fluency). The "divergent thinking" (q.v.) of Guilford's exploration of creativity (q.v.) is not stressed.

The theory deriving from Freud, while usefully stressing the importance of verbal symbolic forms among the media by which the organism adapts to its environment, has

provoked the "psychobiographical" method, which explains formal effects in works of art as expressive of known (or even unknown) proclivities or childhood experiences of the author, or turns a character in a work into a complex case-history (e.g. Jones, 1954). Hence certain scenes and word-play in *Alice in Wonderland* have been judged demonstrative of Lewis Carroll's obsessive sexual interest in pre-adolescent girls, even though his own works in symbolic logic allow of alternative decyphering. Burke (1941) summarizes critically helpful aspects of Freudian theory. Derrida (1967) and Starobinski (1971) separate the metaphysical assumptions of psychoanalytic criticism from suggestions deserving of experimental investigation.

Approaches based on the theory of Jung (1928, 1933) deliver works from overly biographical analysis to make them guardians of eternally recurrent archetypes (e.g. Bodkin, 1934). Jung also distinguishes the "psychological" or conscious from the "visionary" or primordially powered modes of artistic creation, and cites the first and second parts of *Faust* as distinctive of the two modes. But explication by reference to the collective unconscious can pointlessly replace recourse to analogous works known to an author.

In the more general area of philosophical esthetics, the problems of *creative motivation* and *audience response* are conflated in speculation on (literary) *form* as expressive of the human need to order things not only by reflection (*mimesis*) but by inventing (and reading) fictions: Vaihinger (1924) and Wittgenstein (e.g. 1966) have offered some of the most influential hypotheses in this regard, which stress the functions rather than the "meanings" of linguistic fictions.

Although the deviant cognition and expression of creative writers, especially poets, have been assessed almost as equivalent to the idiosyncrasies of some schizophrenic thinking and language (a notion not modern but classical in the characterization of the poet as divinely "possessed"—Mednick, 1962, offers an up-to-date "associative" version), pre-

cisely these creative departures from the linguistic norms and jargons of a society are the object of stylistic studies which use (statistical) surveys of spoken and written language (see *Computational linguistics*) to estimate the *degree* of originality. Intermediate to this classification of surface phenomena and ambitious descriptions of supposed underlying psychic mechanisms is the investigation (e.g. Shlovski, 1929; 1971) of literary art as the "singularization" or conscious liberation by the writer of the reader's "unconscious", automatic perception of things and actions (see also Bühler, 1921). More incisive are Horkheimer's and Adorno's (1972) post-Freudian analyses of influential "mythic" works (e.g. the *Odyssey* and de Sade's *Juliette*) as keys to the fatally self-destructive tendency of (scientific) enlightenment.

(c) The earliest, still influential, classification of literary kinds and inductive formulation of the common principle of audience reaction is Aristotle's *Poetics* (?335+ B.C.). Among other things, Aristotle discusses the psychological origin of poetry, the analysis of structure, and the emotional effects of tragedy. Plato's earlier ethical attack on the presumed ill-effects of excessive stimulus from poetry, and Aristotle's remarks on the cathartic effects of tragedy as stimulating the emotions (q.v.) in a "right" way, i.e. that which helps produce individual and social equilibrium, have grounded much later argument on the ways in which literature "rouses" the "emotions". Simplistically reduced, the two standpoints are paradigmatic for modern discussions of the effects of literary works, deemed capable of "corrupting" or "depraving", because they are "too" erotic or politically deviant.

While elaborating a theory of good literature as a "harmonious equilibrium of impulses" (and allowing it a truth of coherence, whereas science enjoys a truth of reference, e.g. 1936), Richards made a quasi-scientific attempt to detach literary criticism from biographical and historical

evidence, and records (1929) the failures and extraneous suasions of undergraduates required to read unidentified texts. The validity of his findings has been criticized on the grounds that such "laboratory" conditions tend to remove the knowledge of context necessary to a full response, and therefore the duplication of typical poetry-reading conditions.

(d) More related to Fechner's controlled experiments in shape preference are the conclusions suggested by Burt (e.g. 1933), corroborated by Bulley (1933), and reported by Dewar (1938), Williams *et al.* (1938), and others. Burt attempted a factor analysis of esthetic cognition, using among others tests of poetical appreciation, and established a "general factor for artistic ability" operative in all expressions of esthetic taste even when differences in experiencing subjects' intelligence had been excluded (the exclusion of knowledge, convention, etc., as determinative of preference, was not shown). In more intensive research (e.g. Dewar, 1938; Eysenck, 1940*a*, *b*, 1941; Williams *et al.*, 1938), specialized factors were revealed for the esthetic appreciation of literary content, and two bipolar factors demonstrating preference for classical as against romantic, and realistic as against impressionistic style: a bipolarity interpreted as roughly identical with extraversion-introversion and radicalism-conservatism. (See *Type; Attitude*.) Eysenck postulated a *general factor of esthetic ability* ("T" factor) on the basis of these more rigorous tests, which excluded the factor of knowledge as far as possible. (See *Experimental esthetics*.)

(e) More educators are coming to think that the use of "good" literature in education (e.g. the teaching of language skills through reading literature and through "creative writing", the widespread conviction that "great" works—or even "socially-relevant" mediocre works—help to form a good man cf. Sartre, 1950) demands more psychologically respectable evidence as well as culturally acceptable assertion. Authors and researchers from Vygotsky (q.v.) to Bernstein (see

Language; Grammar; Psycholinguistics) are called on variously to justify the value of literature in extending language use at crucial stages and among the disadvantaged, and the effectiveness of, e.g., verse writing as a (necessary) form of self-discovery and creation. As yet none of these large claims is any more proven than Caudwell's (1937) attempt to Marxize Freud and assert the individual and social value—even necessity—of lyric poetry by analogy with work rituals and songs. The whole area of literature in education offers much scope for psychological research.

Despite the absence of scientific evidence, it would be ludicrous to assert, however, that the modes of knowing, presenting and interpreting the ways of man that we inherit as the literary constructs of, say, Sophocles, Shakespeare and Joyce, are less privileged than certain mid-twentieth-century psychometric designs; as ludicrous as it would be to assert that psychology could not help develop strategies to tackle major, recurrent problems that literature is powerless to resolve. "O the mind, mind has mountains; cliffs of fall/Frightful, sheer, no-man-fathomed. Hold them cheap/May who ne'er hung there" (G. M. Hopkins). Typologies may be used to classify such a mind; drugs to numb its physiological substrate; a Turing machine to simulate its "faultless" operation; but without precise *literary* analyses (that those few lines may stand for) of what mind means to man, psychology fails to apprehend the nature of mind and man. (See *Humanistic psychology*.)

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Litotes type. Opposite of hyperbolic type (q.v.).

Little's disease (syn. *Spastic diplegia*). After the London surgeon W. J. Little (1846): collective term for certain forms of cerebral

paralysis of childhood. Bilateral, spastic paralysis with disturbed gait, subnormality, epileptic attacks, etc. Produced by antenatal defects due to, e.g. encephalitis, congenital syphilis, or birth injuries. *E.D.*

Loading. The degree of correlation of a test with a factor. See *Factor analysis*.

Lobotomy (syn. *Lobectomy*; *Leucotomy*). Operations on the human frontal lobes (q.v.) by which fibers connecting them to the thalamus and hypothalamus are variously severed. The Portuguese neuropsychiatrist Egaž Moniz (together with his colleague, the neuro-surgeon, Almeida Lima) introduced the era of psychosurgery in 1935, with frontal lobotomy as the main technique. Recourse to the method in psychiatric cases reached its peak in the late nineteen forties and early fifties, since when it has increasingly declined with the use of drugs in the treatment of psychoses (q.v.). The operation is intended to remove the emotional components of disturbing conditions, such as psychotic experiences, illusions, compulsions, etc. From the start, this form of brain surgery has encountered moral and ethical objections because the irreversible defect produced can affect the most personal of the patient's mental and intellectual traits and abilities. This defect corresponds to the syndrome of a more or less considerable brain lesion with disturbed reasoning, and personality deterioration in the sense of a cerebro-organic passivity, impaired differentiation, and affective blunting. Only when all other attempts at therapy have failed, is the method indicated for critical and severe forms of paranoic and catatonic schizophrenia (q.v.), chronic depression (q.v.), and erethic forms of oligophrenia. See *Stereotactic methods*.

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Local excitatory potential (syn. Local excitatory state, abb. LES). The local, initial reaction of increased, superficial negative potential on a membrane on application of a stimulus.

Localization of psychological functions. The localization of psychological functions in the cerebral cortex is a major problem of neuropsychology (q.v.): it is the question of the *functional organization* of the cerebral cortex, which is the most important apparatus of psychological activity.

Over the years, conceptions of localization have changed considerably in accordance with notions of the structure of psychological processes.

When psychology was dominated by the idea that psychological functions were inborn “abilities”, it was believed that not only elementary functions such as the main forms of sensation (skin, visual and auditory senses), but complicated psychological functions (speech, writing, ideation, concepts, complex needs) were located in limited areas of the brain and were a function of *isolated* groups of nerve cells. F. J. Gall (see *Phrenology*) and the “restricted localizationists” (K. Kleist in Germany and J. Nielsen in the USA) advocated these ideas. The corresponding sections of the article on *Brain pathology* discuss this “traditional aspect” of the subject. Clinical experience refuted such conceptions; it was shown that limited lesions

of the cerebral cortex never lead to the “elimination” of isolated functions, but always disorganize an entire complex of complicated psychological activities, and that one and the same “function” can be disturbed through variously localized injuries of the cerebral cortex.

At present the dominant conception is that complex psychological processes are not carried out by individual nerve cells and cannot be “localized” in limited sections of the brain; they always depend on an entire complex of cortical zones operating in concert, and on the subcortical apparatus, in such a way that each of the components of this complex makes its specific contribution to the operation of the whole functional system.

Hence visual perception (q.v.) requires the participation of the occipital (visual) sections of the cortex, which cooperate with the “eye-movement fields” of the parietal-occipital and premotor area; but the lower parietal sections of the cortex also participate, producing the synthesis of the consecutive impressions to a simultaneous, organized whole, as do the speech zones of the cerebral cortex, which maintain attentiveness and inhibit secondary stimuli.

Just as complex is, e.g. the cerebral organization of movements (see *Brain pathology; Aphasia*) or even more complex forms of psychological activity (verbal behavior, intellectual processes, etc.).

In all these cases, the organization of psychological processes is contributed to, not only by the cerebral cortex, but by formations in the brainstem (especially the reticular formation), which serve to ensure constant cortical tonus and participate in the process of “imprinting” engrams (see *Memory*).

The above-mentioned views (“systematic” or dynamic localization of functions) made it possible to reformulate the problem of the organization of psychological processes in the brain; above all they provided a scientific basis for the evaluation of the disturbances of

psychological processes occurring with local brain damage.

Modern ideas of the systematic localization of psychological functions make the neuropsychological analysis of local brain lesions one of the most important methods of investigation of the structure of psychological processes. See *Localization theory*; *Neuroanatomy*.

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Localization theory. The theory that specific mental functions correspond to areas of the cerebral cortex. The contrasting theory is the flexibility (or plasticity) theory, according to which each individual activity requires the cooperation of several cortical areas or the participation of the entire cerebral cortex, individual functions are *not* localizable, and each area can take over all possible functions. An elucidation of this major set of problems is still awaited from ongoing research.

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Local sign. R. Lotze (1912) defined "local signs" as local values which (in addition to qualitative contents) are present in all sense experiences and which enable consciousness to reassemble from the totality of impressions an image of their spatiality, thus allowing one sense experience to be marked off from other sensations. In his theory of complex local signs, Wundt (q.v.) (1910) described "inner tactile sensation" (sensed eye-muscle tension) and qualitative difference in retinal excitation according to the location of the receptor as essential components of visual perception (q.v.), and derived from them a theory of monocular and binocular vision. The local-sign theory has been criticized. See *Empiricism*; *Nativism*.

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Locomotion. 1. In comparative psychology: the movement from place to place of free-moving organisms under their own power (see *Taxis*); dependent on species-specific, inborn coordinations of movement (E. von Holst). 2. In Lewin's topological psychology: the realization of behavioral possibilities by actively changing the relations or position of an individual to or in his life space (psychological locomotion), in the sense of spatial progression (physiological locomotion), of social "progress" (social locomotion, or self-development), or of cultural progress (intellectual, spiritual or cultural locomotion).

F.-C.S.

Locomotor ataxia. See *Ataxia*; *Romberg's sign*.

Logarithmic curve. A graphic representation of a function, generally yielded by the equation $Y = a \log X + b$. One coordinate is the natural value of a variable, and the other the logarithmic value of a variable. *G.Mi.*

Logarithmic paper. Graph paper whose measured distances on one or both axes are logarithmic, i.e. proportional to the log of the corresponding values. In the case of the logarithmic dependence of two variables ($Y = a \log X + b$ or $\log Y = a \log X + b$) the graph of the observed values of X and Y is a straight line. Logarithmic paper can therefore be used as a quick method of testing whether the dependence of two variables can be represented by a logarithmic function.

G.Mi.

Logic. See *Logical reasoning*; *Decision processes*.

Logical positivism (syn. *Logical empiricism*). A collective term for those views emanating from the Vienna Circle, and now associated mainly with Rudolf Carnap, that stress the

unity of science; intersubjective scientific language; verifiable, factual, experiential knowledge; and the logical analysis of (especially scientific) language and knowledge as the task of philosophy.

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Logical reasoning. Reasoning occurs whenever a conclusion is derived from premisses (deductive reasoning), or a generalization is established from instances (inductive reasoning). The criterion for adequate deductive reasoning is logical validity, but no such criterion exists for inductive reasoning.

1. *History.* The concept formation task, in which instances are presented by the experimenter one at a time, has traditionally been used to simulate inductive reasoning. In 1956, J. S. Bruner and his associates revolutionized this model by freeing the subjects to determine which instances they wished to test. This allowed a comparison with certain "ideal strategies". Around 1960, a further liberalization was achieved by P. C. Wason and G. A. Miller, whose tasks had a potentially infinite number of instances, and thus matched more closely the conditions of inductive reasoning in real life. Both results showed that subjects were frequently satisfied with partial solutions which they failed to test.

Gestalt psychologists, such as M. Wertheimer and K. Duncker, were eclectic in their choice of task. They stressed particularly the importance of reorganizing the perceptual field in accordance with its own internal "requirements".

2. *Present research.* Three themes characterize current research.

(a) *Linguistic variables.* Previous research on deductive reasoning had stressed the effect of the "atmosphere" conveyed by the linguistic form of the premisses upon the inferences made (R. S. Woodworth). The

intensive development of linguistics in recent years has made psychologists much more sensitive to the role of language in reasoning. H. H. Clark's theory rests mainly on results obtained with three-term series problems (for instance, "x is worse than y"; "x is better than z"; "who is worst?"). The theory is based on the underlying linguistic properties of the premisses, specifying that certain relations will be more salient and readily processed than others.

In the same tradition, P. N. Johnson-Laird has carried out the most thorough investigation of the meaning of ambiguous quantified terms (for instance, "some", "every", and so on) and then shown that their order within a sentence predicts their interpretation in a reasoning task. Research of this kind goes well beyond global concepts such as "atmosphere effect."

(b) *Representational variables.* A different approach assumes that the individual constructs an abstract representation of a problem from which the solution may be read off. The pioneer work was done by C. De Soto and by J. Huttenlocher in the mid 1960s. Some doubts, however, have very recently been cast on De Soto's arguments by S. Jones, who used a task which imposed fewer constraints. The full implications of the linguistic and representational approaches are still unclear so that it is hard to formulate the evidence which would count against each.

(c) *Formal variables.* During the same period Wason developed a task in which the subject has to test whether a rule is true or false by selecting information from which a valid inference could be made. The task proved extremely difficult, even for the most intelligent individuals, and is still under investigation. However, in collaboration with Johnson-Laird, an information-processing model has been devised which postulates that insight is correlated with the increasing awareness that falsification is more crucial than verification.

3. *Conclusions.* The psychology of logical reasoning has recently enjoyed a modest

revival, and it will remain of absorbing interest because of its concern with the scope and limitations of man's inferential powers.

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Logopedics. The systematic treatment of inborn or acquired speech defects (e.g. stuttering, certain aphasias).

Logotherapy. A psychotherapeutic method introduced by V. Frankl of Vienna, and directed not so much to the study of conflicting drives as to the activating (motivating) mental level in the individual, in order to enable the patient to discover the meaning of his life. The noetic levels of the personality (see *Strata theory*) are multi-stimulated by means of a "paradoxical" reaction, i.e. the patient is put into extreme situations to which he is compelled to react. The method is currently achieving some success in the United States, where the first research institute devoted to logotherapy has been established.

Logotherapy mobilizes the antagonistic psychonoetic forces against neurotic symptoms; i.e. it tries to promote the specific human ability to throw off neurotic symptoms, to fill the existential vacuum of the neurotic, and to make him conscious of the full range of his actual possibilities, thus confronting the patient with the "logos" of his existence.

J.L.I.

Long-distance hearing. This enables a person to estimate the distance of a source of sound from his ears. Essential factors are the ex-

perience of the acoustic stimulus, the intensity of the sound (the louder, the nearer) and the frequency spectrum (the deeper, the nearer; the higher, the farther away). See *Auditory perception*. P.S. & R.S.

Long-distance vision. This enables distances to be estimated with the aid of the optical apparatus. Essential factors are properties of the eye such as convergence (q.v.), and properties of the optical field such as apparent size of object, perspective foreshortening, shadow formation, overlapping and light absorption. Binocular estimation of distance is more accurate than monocular, as the latter can only make use of the optical field factors. See *Visual perception*. P.S. & R.S.

Longitudinal disparity. See *Horizontal disparity*.

Longitudinal studies. The aim of longitudinal studies is to investigate psychological and physical phenomena and behaviors in the course of development. They are contrasted with *cross-sectional studies*, in which other groups of testees are examined at each age level, in this way providing only average development curves. Investigations of physical or intellectual achievement/performance usually show that they have a rapid beginning and then rise ever more slowly, approaching their upper limit asymptotically. These development curves correspond precisely to the average learning curves. In the individual case, however, there are considerable deviations from this average pattern: the starting-point of the rise can be earlier or later, and the maximum can be reached at different points of time. In addition, the rise is seldom wholly regular, since there is a fluctuation between periods of slow and fast improvement. Only longitudinal studies can enable these changes to be viewed proficiently.

To a certain extent, biographies and diaries

kept by parents in regard to their children are longitudinal studies, but these offer no possibilities of comparison, since there is no way of determining the influences of environment and genetics. Such observations reveal the problems which have to be examined in systematic investigations. Anamnestic and catamnestic investigations can be thought of as rudimentary forms of longitudinal study. The duration and starting-point of a longitudinal study depend on the basic problem under investigation.

1. *The object of longitudinal studies.* Most such studies are basically concerned with the way in which a child with specific traits or abilities will develop. This question may be more precisely formulated according to two main emphases: (a) How constant is the trait? (b) What are the effects of the environment? Very often the two questions are treated in the same longitudinal study.

(a) In the background there is, of course, the question of the genetical conditioning factors, for only such a basis can allow constancy: e.g. various investigations of IQ constancy, and Gottschaldt's twin studies, which also included temperamental traits. The first major longitudinal study on this basis was carried out by M. Shirley at the end of the nineteen twenties in regard to motor, cognitive and general behaviors, using twenty-five children; the investigation lasted two years, and was undertaken from birth. Only the degree of proneness to disturbance showed any major consistency, and this was confirmed with a follow-up study after seventeen years. In general, it was shown that the correlations were less the longer the time between the compared measurements, and the earlier the date of the first one. The clearest investigations in this respect are those into intelligence (q.v.), since they can avail themselves of the best test instruments. In regard to personality variables, it has been shown that the level of correlations does not decrease gradually, but in some cases can rise again after a transient diminution. In addition, it was found that the degree of concordance

for boys and girls in regard to behavior at different ages can often be quite different. All these results indicate a considerable environmental effect. The most extended longitudinal study, which has provided a large number of findings, was carried out by L. M. Terman (1925) with over one thousand gifted children (IQ over 140) in their eleventh year of age. The last results were made available after an interval of forty years. In Terman's investigation, it was a question of testing whether intelligence remained constantly at so a high a level, in order to examine the effect of environmental influence, what would become of these children, and to what factors later vocational achievements could be attributed.

(b) A straightforward example of this type is provided by the major investigation into German children just after World War II, carried out by C. Coerper, W. Hagen and H. Thomae. It confirmed the general influence of unfavorable developmental conditions on physical and psychological development. In most longitudinal studies concerned with environmental influences, such socio-economic modes are not to the fore, but the more specific family relations and parental attitudes (particularly those of the mother) to upbringing. Bayley's & Schaefer's (1964) and Kagan's & Moss's (1962) studies are good examples of this kind. Important, and unforeseen, results were obtained: e.g. dependence of IQ at thirteen years on maternal behavior in the first three years.

2. *Methodological problems.* The transition to longitudinal studies brought about a radical extension of the methods of developmental psychology. No longer the isolated transitory event was in the foreground, but man in the entirety of his development was a problem for empirical research. This gave rise to many new methodological questions.

(a) There is a purely external difficulty in the amount of labor involved, and the large number of staff required. Such studies can be carried out successfully only by specialist institutes. The first longitudinal studies were too

broadly designed, since knowledge was then insufficient to show which observations or measurements would prove fruitful later on. The data from the first major longitudinal studies revealed the special problems which can be fruitfully examined in isolation. It is now possible to mount effective short-term longitudinal studies—at precisely the times when considerable changes are to be expected.

(b) In the field of physical, motor and intellectual behavior there are certain techniques whose relevance in infancy has not been adequately investigated. In regard to personality variables, the first years of these studies showed a concentration on observation and interviews of mothers. Very little is known about the reliability of these data, which leads one to suspect that correlational findings in part result from untrustworthy methods of data collection.

(c) The major difficulty is the measurability of psychological variations. They can certainly be described, and, if a parameter can be isolated (e.g. for body size or weight), measured as well. In the mental sphere this is usually not possible, for the alterations consist of the responses and the situations which release a behavior under investigation. At every age level, new intelligence tests must be given and new situations devised, in order to release aggression, frustration, joy, etc. When, in general, there are very low correlations with the data from the first months of life, this may be attributed to the poor reliability of the data, but also to the fact that the thing measured was irrelevant in comparison with the later findings. Therefore Meili (1957) has attempted another strategy for longitudinal studies of personality development. Through observation, he seeks out situations in which there are (to some extent) actually detectable individual differences in the infant, and tries to find with what later behaviors correlations exist. It is then evident that common conditions must exist in the earlier and later behaviors, however different the situations and responses may be. This technique has been shown to

yield clear correlations up to seventeen years of age. Quite unexpectedly, the highest previous correlations with intelligence performance were confirmed—in fact, with responses in perception situations in the fourth month. This technique seems to avoid most of the methodological difficulties encountered with longitudinal studies.

Longitudinal studies are certainly among the most complex though sensitive methods of investigation, since they combine the developmental-psychological and the differential viewpoints, and therefore come closest to the actuality of the psychological process. See *Child psychology; Differential psychology*.

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Lordosis. A curvature of the spine such that the back is concave. The condition is usually pathological, but it also occurs naturally as a sexual response (receptivity) in many female animals. G.D.W.

Lord tests. A group of statistical test methods in which range (R) is used to measure dispersion.

Bibliography: Lord, E.: The use of range in place of standard deviation in the t-test. *Biometrika*, 1947, 34, 41-67.

Loudness. A term for the intensity of a sound process as judged by an individual. Sound pressure level as expressed in decibels (dB) is (approximately) numerically equal to loudness level expressed in phons for a sound of frequency 1000 Hertz (Hz) or cycles per second. The loudness of other sound processes is determined by comparison of subjectively judged sound with the reference sound of frequency 1000 Hz or with the aid of an electrical sound level meter. See *Noise exposure to*. W.P.

LSD. See *Lysergic acid diethylamide*.

LTH. See *Luteotropic hormone*.

Lubrication, vaginal. Usually occurs a few seconds after effective sexual stimulation, leads to moistening of the vagina and the external genital area, and probably results from seepage from congested vaginal blood vessels. The moisture (whose chemical composition is still unknown) appears initially as a "sweating" of the vaginal walls and is not, therefore (as was long supposed), produced by Bartholin's glands or, through the cervix, from the uterus. Vaginal lubrication makes the vagina receptive to intromission of the penis. See *Preejaculatory secretion; Orgasm*. V.S.

Luminosity. The relative brightness (q.v.) of a light source.

Luria technique. See *Conflict*.

Luteinizing hormone (abb. LH). A hormone which stimulates the formation of luteal tissue after ovulation.

Luteotropic hormone (abb. LTH; syn. *Pro-lactin*). A gonadotropic hormone produced by "releasing factors" in the anterior pituitary. Together with gonadotropin LH, it is said to stimulate the development of, and progesterone formation in, the *corpus luteum* (whether it does this in men as opposed to mice and rats is still contested), and, together with estrogens and progesterone (q.v.) stimulates the growth of the female breasts. At the beginning of lactation, it initiates milk formation and secretion, and is therefore sometimes known as the "lactation hormone".

Bibliography: See *Gonadotropic hormones*. H.M.

Lymphatic constitution. A physical constitution characterized by an especial emphasis from the lymphatic organs. A pale skin and a tendency to cutaneous inflammations are symptomatic. The lymphatic constitution is often met with in conjunction with the "hypoplastic" physique. W.Se.

Lysergic acid diethylamide (abb. LSD; syn. *Lysergide*). One of the psychotomimetic group: lysergic acid derivatives. There have been many psychological investigations with LSD, on account of the unusual "psychedelic" effects (especially at high doses), which are wholly novel for most Ss. The interpretation of such tests (which are often unsatisfactorily controlled) is frequently open. E.g. the confirmed diminution of intellectual performance may result from disturbances in the intellectual area, or from reduced motivation. The same is true of psychomotor impairments of performance. Effects on perception are manifold and of especial interest for study of perceptual variations resulting from psychomimetic substances (hallucinations, illusions, etc.). The following are some of the results observed: a rise in absolute visual threshold (more intense for photopic vision), an intensification of subjective color experiences with non-colored stimuli, diminution of color

discrimination, changes in size, direction and distance perception and time sense (over- or under-estimation of pre-existing periods of time. LSD increases primary suggestibility (q.v.). The mechanism of the pharmacodynamic effects of LSD is as yet unexplained. One much-discussed hypothesis is that LSD enhances serotonin (q.v.) in the brain. LSD has been used in psychotherapy in the psychoanalytic treatment of neuroses, and even alcoholism (q.v.). Its effectiveness as a therapeutic aid is questioned.

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Lytic type. A subtype of Jaensch's S type, which includes chronically sick individuals, sufferers from, e.g. tuberculosis, schizophreniform thinking, or hysteriform ego-conversion. W.K.

M

MA. Abb for *Mental age* (q.v.).

Mach, Ernst. B. 18/2/1838 in Turas (Moravia); d. 19/2/1916 in Haar (near Munich). Professor of Physics at the University of Graz from 1864 to 1867, and at the University of Prague from 1867 to 1895; Professor of Inductive Philosophy at Vienna University until 1901.

Mach represented a non-metaphysical positivistic functionalism. He believed that no finding in the natural sciences is permissible unless it has been empirically verified. His criteria for verifiability were extremely strict. He considered scientific laws to be purely descriptive, and that a choice between two alternative hypotheses about the same phenomenon should be made on the basis of economy. He thought that all mental life could be reduced to the basic components of sensations and their associations. The combination of these elements in the sense of a reinforced ideational economy occurred in the abstraction processes of thought (q.v.). Mach's experiments in the area of optical, acoustic and motor sensations were also important for psychology. The *Mach tambour*, or drum, was a rotating cylinder used to evoke illusions of movement in the enclosed subject; *Mach's ring* was a rotating disk for the detection of contrast phenomena. Lenin mounted a furious attack on Mach and Machians in his "philosophical" treatise.

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Machine code. See *Machine language*.

Machine language. A program language suitable for a particular type of computer. Each computer has a fixed repertoire of operations which it can handle with given data. The operations are triggered by machine instructions written in a machine code (generally a binary code). A machine language consists of mnemotechnical abbreviations associated with the machine commands, e.g. "add price". K.D.G.

Machine learning. The ancient idea of learning machines has won new impetus as a result of electronic data processing and cybernetics, not only because of the newly-acquired speed and storage capacity, but because of the flexibility now attainable. Learning machines are desirable both in order to simulate organic structures (e.g. conditioned reflex behavior) and, in programming, to allow the machine

itself to assemble and apply its own experiences.

Whereas the application of the concept of *thinking* to machines seems inappropriate (from a purely natural-scientific standpoint, too), there is no objection against learning in this regard, since even human learning depends on the acquisition of automatisms. To be sure, there is a profound difference between biology and technology, even though the literature in the field of engineering tends to far too easy equations of the two. The most important "technical" opposition is that between the *analog* organization of the nervous network and the *digital* machine system. In the body, magnitudes are represented by the number of nervous impulses per second, whereas digital signals represent chains of logical decisions.

Biologically and psychologically, the concept of "learning" (q.v.) is (for good reasons) somewhat imprecise, whereas the machine requires rigorous elucidation in order to carry out its formally perfect operations. Therefore it is possible to divide learning into a preliminary stage and seven varieties. The preliminary stage of *classification* is closely connected with sign recognition—which first makes learning proper possible; on the other hand, recognition is usually "linked" learning. Input signals are available to the machine, just as in the organism they are received by the sense organs (signal converters) and have to be reduced to sign classes. Learning by *storage* (1) is, e.g. learning by heart: but forgetting is the contrary. Tapes and films are rigid storage media: they neither forget nor learn. Only the computer store and logical processing permit of more than replays. Learning by *conditioned coordination* (2) is the basis of all higher combination and precise conclusions. Associative mechanisms and calculation of probabilities also come in here. *Trial-and-error* learning (3) is requisite if the stored experience is inadequate. The less there is of it, the smaller the number of presuppositions, and the greater the number of learning steps that have to be taken.

Learning with *optimization* (4) mathematizes this principle with the aid of a (sought for) maximum of successful learning. But the machine has difficulty in recognizing whether it has reached a near-maximum. Learning by *imitation* (5) or *instruction* (6) presupposes very complex machines; therefore only simple marginal cases have been investigated. Learning by *comprehension* (7) is something beyond the limits of the machine.

Examples of early (i.e. *circa* 1950) learning machines are the *machina speculatrix* or *electric tortoise* of W. G. Walter—Pavlovian conditioned reflex behavior, type (2)—and C. E. Shannon's *maze-solving machine*—automatic orientation, type (3). W. R. Ashby's homoeostat—a model of ultra-stability, type (3)—falls outside the present discussion, since it is an analogue device without a store. These models seemed to prove that electronics could dynamically simulate organic structures. More important than the actual automata, however, was the insight gained in developing the fundamental logical structure. Description is restricted to the essential parameters (a few values) and relations. Hence learning machines actually comprise an intermediate step toward the formal description of physical and psychological phenomena and behaviors.

Attention has also been given to the details of nervous networks and their learning characteristics; but since atomic details are important in the neurone, a precise model would require a whole computer to itself. K. Steinbuch's *learning matrix* and F. Rosenblatt's *perceptron* were conceived for technical application; to date there has been no actual industrial use, but the perceptron has become a basic mathematical model for decision theory (see *Decision processes*). The attempt to replace logical programming with statistical sequences and a definite goal failed in view of the number of steps required—despite the electronic speed possible.

Generalizations of learning machines are self-organizing automata which attempt adaptation to the environment and the development

of new (learning) structures for better adaptation by means of a super-program. Whereas the improvement of model parameters can be successfully automatized on the basis of experience through actual application, difficulties multiply with the generalization of the problems. Problem-solving, game-playing and composing machines encounter such difficulties, especially when conceived as learning machines. A. L. Samuel's program, for instance, was a step forward, since it learned by the book. Further improvements have to reckon with the (hopefully not insurmountable) limits of learning machines.

Steinbuch has justly remarked that the success of learning machines depends on the quality of the image which the internal program is able to make of the external world. However, the way from this theoretical finding to its practical realization is clearly not easy. The expectations of the nineteen fifties were certainly answered with some results, but sober piecemeal research has replaced excessive hopes. See *Communication; Cybernetics and psychology; Information theory; Instructional technology; Simulation.*

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H. Zemanek

Machover test. See *Draw-a-person Test.*

Macula lutea. The yellow spot, with a diameter of 5 mm, surrounding the 0.5 mm *fovea centralis* at the point of intersection of the optical axis of the eye and the retina. K.H.P.

Magical thinking. 1. Frazer (1913) derived magic from two erroneous applications of image association: he attributed "homeopathic" magic to a misunderstanding of the law of similarity, and "contagious" magic to a misunderstanding of the law of contiguity (see *Association, laws of*). Although magical thought is by no means absent from many individuals in a developed civilization, attempts have been made to present it as a peculiarly primitive form of thinking, necessarily resulting from the fact that a "primitive" man thinks not logically but according to the principle of "mystical participation" (L. Lévy-Bruhl). Modern ethnologists (Lévi-Strauss, 1963, 1967; Malinowski) reject the view of magic as "primitive" thought. "Primitives" certainly think logically and sequaciously in other areas, and magic has many important "psychotherapeutic" functions.

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2. The magical thinking and behavior of childhood are characterized not by a search for factually consistent relations, but by allowing for any possible relation between things. The child also tries to influence events by "egotistic" sets, imagining that his wishes can influence things. Magical thinking begins at some time between four and seven years of age and later becomes more differentiated.

M.Sa.

Magnetism. See *Mesmer, Franz Anton.*

Maintenance. 1. Maximum growth. 2. Continuance in a state of equilibrium. 3. Measures to ensure smooth running of, e.g. a plant, and optimal man-machine functioning.

Major principal axis. See *Principal components method*.

Make-a-picture-story test (MAPS). A thematic method described by Shneidman in 1952. Subjects are asked to build pictures from twenty-two background representations and sixty-seven individual figures, and tell accompanying stories. The advantage of individual arrangement of the stimulus field by comparison with a given field is seen by the author to lie in heightened activity of the subject, and greater personality relevance of the self-composed scene and accompanying story. See *Thematic Apperception Test*.

Bibliography: Shneidman, E. S.: Manual for the Make-a-picture-story method. Projective Techniques Monographs, 1952, 2. D.P.

Maladaption. An organism's failure to develop in the way requisite for survival.

Maladjustment. An inability to adjust to one's own, social, vocational, or environmental demands.

Male protest. A tendency (which occurs in men and women in the context of compensation of feelings of inferiority) to reject apparently feminine stimuli and play a dominant, active role. The male protest occurs only in patriarchal social structures; according to Adler (q.v.) it is characterized by defiance, a desire to dominate, oversensitivity and ambition. W.Sch.

Mana. A Polynesian term, signifying in psychological anthropology (q.v.) a numi-

nous, magical power which resides in certain individuals (chief, king or magician), things (word, weapon or image), or animals (lion, eagle, wolf or snake), and under certain circumstances is imparted to the faithful: positively (e.g. healing) or negatively (e.g. a curse). Figures filled with mana emanate "fascination"; they both attract and fill with awe. They are taboo (q.v.). This numinous fascination is most obvious in the cult of the "Great Mother" (icons, etc.). In popular superstition, mana also appears as a structural element of authority, especially in kings and nobles and ecclesiastical dignitaries (ordination and consecration as mana). E.U.

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Mandala. In certain Eastern religions (Lamaism, tantric yoga) a mandala is a symbolic drawing for contemplation; it usually combines a circle and a square as the basis of various refined ornamental designs. In Jung's complex psychology the mandala is a symbol of the self-development aimed at in the individuation process. W.Sch.

Management. A general term for measures taken by superiors which influence cooperation, coordination and communication between all members of an organization.

Management style: general way in which an organization is managed (e.g. authoritarian, patriarchal, dictatorial-authoritarian, cooperative).

Types of modern management: participative management, internal management of the German army.

Management behavior: the management methods used by individual hierarchical superiors in everyday work.

Management method: the method of using instructional and controlling powers which is best suited to the given situation or person (e.g. command, instruction, training, discussion, personnel evaluation).

Management training: training executives in methods of leading and evaluating their

colleagues. Purpose: to create a management style which is valid and binding on the whole organization.

Management problems: clarification of the principles of rule, power, misuse of power and manipulation; authority and prestige; rights and duties of the individual, the (working) group and organization as a whole; role and role expectations of the superior. See *Group dynamics*; *Industrial psychology*; *Occupational psychology*. G.R.W.M.

Bibliography: Dubin, R. (Ed.): *Human relations in administration*. New York, 1962. Humble, J.: *Management by objectives*. London, 1969. Lupton, T.: *Management and the social sciences*. Harmondsworth, 1971. Tillett, A., Kempner, T. & Wills, G. (Eds.): *Management thinkers*. Harmondsworth, 1970.

Mand function. Skinner's term for an imperative verbal operant. See *Conditioning, classical and operant*.

Mania. Used either as a descriptive or diagnostic label. A syndrome characterized by an elevation of mood, i.e. from optimism, hilarity and euphoria to elation and ecstasy. It is almost always accompanied by some disturbance of thought, i.e. grandiose ideas, flight of ideas, over-production of ideas and speech, and by an excess of movement. Mania is one pole of the bipolar illness *manic-depressive psychosis* (q.v.). In practice the cardinal affective symptom of elevated mood may be replaced by an irritable and suspicious mood, i.e. *irritable mania*. Its differentiation from schizophrenic excitement may be difficult, hence the need for an awareness of whether a descriptive or diagnostic label is implied. B.B.

Manic-depressive psychosis. Disturbed affect characterized by periods of mania, of severe depression (melancholia) and of normality. There is complete recovery between episodes, which may be manic or depressive or both in succession. The term "psychosis" suggests

that the condition is both severe and endogenous, although the latter may not always be the case. Recurrent depression (episodes of depression alone) are thought to be related because of the similarity of symptoms, because patients may have several depressive episodes before developing mania, and because families are found with both manic and recurrent depressive members. The term *endogenous affective psychosis* covers both conditions, but severe reactive depression is a separate entity in most classificatory schemes, although in practice it may be indistinguishable from depressive psychosis. See *Circular psychosis*. B.B.

Manifest Anxiety Scale. See *Anxiety scales*.

Manifestation. 1. The appearance, disclosure or definite experience of hitherto latent affects or qualities, depending on genetic or situative factors, or—in neurotic manifestations—on, e.g. deprivation. **2.** A paranormal phenomenon. W.Sch.

Manifest dream. See *Dream*.

Manipulation. I. Manipulation may be defined as the management and direction of human beings by a clever use of their *desires* and *qualities* in order to control them for scientific, social or political ends not of their own choosing. This negative definition corresponds to common usage. However, a negative element is absent from the formal, abstract concept of manipulation. "A man is responsible to himself in his freedom. In this sense he should and must manipulate himself" (K. Rahner). This self-manipulation, however, needs ethical evaluation in the concrete case. It must not offend against the foundations of human dignity and freedom.

Methods of manipulation in the first sense are based on: (a) using the traits determined by heredity, and (b) changing these hereditary dispositions.

Reactions can be manipulated by intensive repeated information (propaganda, advertisements) and/or result from stress situations. Extreme over-stimulation or complete absence of stimulation (*sensory deprivation*) causes physiological and mental stress (q.v.). It results in modes of behavior which are foreign to the reflective, free consciousness. Through darkness and isolation, men can be made so eager for rewarded action, that they do or say whatever is required of them (see *Prison psychosis*). The results of such manipulation by sensory deprivation can be of long duration.

The use of sensitivity phases during development makes manipulation easier. Later behavior will be "imprinted" by the environment during these phases, which are often quite short (K. Lorenz, 1935). These "imprints" or impressions, insofar as they have been analyzed in animals, are irreversible. Periods of sensitivity of this nature are, e.g. the second half of the first year of life. During this period, through contact with the mother (or nurse), the foundations are laid for the development of "basic trust" (E. H. Erikson). The child learns that he can trust another person. Deficient contact during this period of sensibility leads to severe and irreparable physiological and psychological disturbances. (See *Hospitalization*.)

Manipulation of heredity (genetic manipulation) can take place through (a) selection of desired (*positive selection*), and rejection of undesired (*negative selection*) hereditary combinations; (b) through planned changes in the biochemical constitution of heredity (see *Genes*); (c) through the cultivation of selected egg cells or embryos within or outside the mother's womb. Of these possibilities only (a) can be realized in the current stage of genetics, e.g. through sterilization or artificial insemination with the sperm of a selected donor (in certain countries: e.g. USA, France). Methods (b) and (c) are conceivable and perhaps will become possible through progress in biology.

Ethical, legal, social and natural laws

are not opposed to genetic manipulation as long as (a) the values and norms according to which the genes are altered or selected in a population are clearly defined and recognized by the members of a legal community; (b) the freedom and dignity of human beings are preserved; (c) the connection with the parents is maintained; and (d) from the point of view of natural science, the process is guarded against an unforeseeable risk of failure (production of mental or bodily abnormality).

II. Social psychological aspects and limits of the term "manipulation". In its value-free usage, the term "manipulation" means *management* or *direction*. It acquires a moral overtone when the phrase "for ends not his own" is added. This moral use of the term is particularly frequent in Marxist analysis when it is applied in the theory of class struggle, to denote the direction of world views, modes of thought, etc., of the masses by the bourgeoisie.

"Manipulation" is not, however, a scientific term. It is more exact to say: where people interact they influence one another. In politics, for example, this is the explicit aim, and even scientific disciplines are sometimes expressly pursued with this end in view (education, psychiatry, clinical psychology, q.v.).

Besides brainwashing, this form of manipulation also includes the use of drugs (q.v.), planned employment of mass media (q.v.), and the possibility of surgical operations for the purpose of changing psychological structures. What is common to all these procedures is that "natural" life is brought under conscious and planned control. Still valid fictional expositions of the implications of such methods are to be found in, e.g. *Zamiatin*, *Orwell* and *Huxley*.

However, as a comprehensive term, "manipulation" is clearly limited. Because people always influence one another, manipulation cannot be regarded merely as a special phenomenon in contrast to other forms of influence. Methodologically, the attempts at brainwashing in Stalin's time should be regarded not as representative but as extreme

cases of planned human attempts to influence one another. It is natural to human beings to form their world view with the help of others. Psychology shows that an individual is always the result of an environment, must be defined in terms of this environment, and can never be abstracted from it—as the term “human nature” implies.

Therefore, although manipulation is not a scientific term (because it is strongly moralistic), it nevertheless shows that attempts by human beings to influence one another need *legitimation*, particularly when these attempts are made in the name of a comprehensive science. The classification of modes of behavior as neurotic, psychopathic, schizophrenic or criminal is not a sufficient form of legitimation, because these terms and their opposites are not exactly enough defined. In particular, the concept of a “normal” or “healthy” human being is highly disputable. Therapeutic behavior is strictly dependent on ideology, and this ideology is often not consciously worked out in all its consequences. This becomes plain even in a so-called objective description of phenomena (see *Prejudice*).

Whereas manipulation has been a popular subject for social critics, e.g. of advertising (Packard, 1957), in scientific studies the term is hardly apparent. This shows how scientists themselves were bound up with the processes of their society, processes which sought not merely to approve certain goals of action but to present “reality” in accordance with these goals. However, the goals that men should pursue cannot be rationally established. Each individual will define manipulation in accordance with his world view, and decide which forms of influence and which tendentious presentations of reality he wishes to call by this name. (See *Aversion therapy*; *Behavior therapy*; *Humanistic psychology*.) H. Autrum

III. Manipulation through drugs. Definition. In the natural sciences, the word “manipulation” first appeared in 1716 in regard to drugs derived from plants. With the appearance of healing by “magnetism”, it received the

status of an art—the art of determining behavior and actions by a particular method.

1. *The problem.* Every therapeutic measure which corrects defects of body or mind with drugs or surgery contains an element of manipulation, because all interference with the nature of another person—even with the best intentions—is an act of power. However, the use of natural science to repair and heal a man has limits, because it is dealing not with a mechanistic structure but with a complicated organism and a human personality.

Modern medicine has helped to preserve life, and has therefore increased the likelihood of the inheritance of “sick” traits. A life-saving remedy can in some situations involve the danger of an undesirable and unintentional manipulation of mankind by the production of hereditary disease in coming generations. This development cannot be avoided without disregarding ethical and moral imperatives and disregarding the doctor’s duty to heal.

2. *Present possibilities.* Drugs with different stimulant and depressive properties can change the content of experience. This form of manipulation has been practiced from earliest times by the use of drugs derived from plants (magic drugs, poisons) to achieve ecstasy, impassivity to pain, and heightened performance. These same drugs are used by many people today in the form of pure substances in acts of self-manipulation to avoid suffering and distress, or to improve bodily or mental performance. In the same way, a group of synthetic psycho-pharmaceutical (q.v.) drugs are used, at times unwillingly or even under duress, for legal or political ends. (See *Brainwashing*.) Such practices, because of their results, are morally and legally impermissible. Likewise, tranquilizers cannot improve the content of information in the brain, nor can they make a person permanently capable of high performance, or take away his pain and trouble for ever. With chronic misuse they may create dependence, or cause physical damage. See *Psychopharmacology*; *Drug dependence*. H. Haas

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Manipulation test. A psychological test to assess manual dexterity. It usually covers two components of movement: *precision* and *speed*. An example is the Minnesota Rate of Manipulation Test (q.v.) devised by G. L. Betts. P.S.

Man-machine system. A system in which typical performance by man and machine to achieve a specific goal is an important factor. Systems in which data-processing machines are involved are used to solve problems through an exchange of information between man and machine in a formal language. The machine undertakes tasks which can be described by algorithms (q.v.), while the human operator is responsible for non-objectifiable tasks of perception, thought and action (e.g. heuristic thought, selection of relevant data, decision in unforeseen cases). An example is the translation of a foreign language in a "dialogue" with an electronic dictionary.

K.D.G.

Mann-Whitney U-Test. A non-parametric test method to compare the central tendency of two independent distributions. It presupposes ordinal variables. The scores of both distributions are ranked and the value U determined for a series; this value indicates the frequency with which a value from this

distribution precedes values of the other distribution. The distribution of U is known for given sample sizes and tables are available.

Bibliography: Mann, H. B. & Whitney, D. R.: On a test of whether one of two random variables is stochastically larger than the other. Ann. Math. Statist., 1947, 18, 50-60. G.Mi.

Manual dexterity tests. Tests for special motor skills (q.v.) based on manual operations. A distinction can be made between (a) test methods for simple movements whose accuracy or speed is measured (e.g. tremometer); (b) handling of objects (e.g. pearl-stringing test); (c) simple operations (e.g. guiding a pin along a prescribed track). The reliability of test methods in groups (a) and (b) is generally very high, while that of group (c) is usually lower because of the smaller series. There is generally only a slight correlation between manual dexterity tests; high specificity and low criterion validity are frequent characteristics. K.D.N.

Manual-genital contacts. Individual or mutual touching or sexual stimulation of the sexual organs of the partner or partners by hand (e.g. stimulation of the penis or clitoris). Active and passive manual-genital contacts are constantly increasing among young people of both sexes between the ages of two and eighteen (Schofield, 1968). Manual-genital stimulation must be considered as (a) one of many possible kinds of coital foreplay; (b) a possibility of practicing and learning heterosexual behavior; (c) a form of substitute heterosexual satisfaction among persons who are inexperienced in intercourse, or as an occasional possibility if coitus is impossible or undesirable for external reasons. According to Kinsey (1953) women are more reticent than men as far as manual-genital contacts are concerned. This does not apply to young people in Sweden, where there is no significant difference between the sexes from the twenty-second year on (Israel, 1970). Educational

levels are clearly a significant factor; the tendency for manual-genital contacts to occur is higher among the more educated than among the less highly educated (Kinsey).

Bibliography: see *Oral-genital contacts*. Israel, J. & Israel, M.: *Modellfall Skandinavien?* Hamburg, 1970. Schofield, M.: *The sexual behaviour of young people*. Harmondsworth, 1968. H.M.

MAO inhibitors. See *Monoamine oxidase inhibitors*.

Marbe effect (Marbe-Thumb law, 1901). The more often an act of free association occurs in a group, the more rapid its evocation in an individual. H.W.

Marey tambour. An historical apparatus for recording physiological responses. It consists of a receiving drum connected by a tube to a rubber membrane which communicates movement through a stylus to be inscribed on a smoked drum or other moving surface. G.D.W.

Marginal contrast. A simultaneous, psychophysical (physiological) contrast phenomenon which occurs at lines of demarcation (contours) and also with planes of varying light intensity where transitions from brightness to darkness are less sharp. Both marginal contrast and inner contrast belong to the group of visual phenomena discussed under *spatial relationships* and have recently attracted much active research.

The *theory of lateral inhibition* has been suggested as an explanation for marginal contrast and a number of related phenomena.

Marginal contrast is not confined solely to the sense of sight, it occurs also with cutaneous sensitivity; and especially with respect to temperature. Tschermak-Seysenegg uses marginal contrast as an aid in correcting optical errors in image formation and constructs a

physiological model for this function of contrast. According to this, marginal contrast acts counter to irradiation (q.v.). A.Ha.

Marginal personality (syn. *Marginal man*). A term used by the American sociologist R. E. Park to denote those individuals who are simultaneously—by personal choice or social circumstances—members of two or more groups which differ substantially in their composition and standards so that the person concerned is always in a multiple marginal position, e.g. on the boundary between two contradictory cultures. W.D.F.

Marijuana (syn. *Marihuana*). A South American narcotic which is prepared from the flowers, leaves and stems of the female hemp plant (see *Cannabis*). Marijuana is smoked. Its effect is qualitatively similar to that of hashish, but less strong.

Bibliography: Norton, W. A.: The marihuana habit: some observations of a small group of users. *Can. Psychiat. Ass. J.* 1968, 13, 163–73. See also *Cannabis*; *Hashish*; *Narcotics*. G.E.

Mariotte's spot. The blind spot of the eye (discovered by E. Mariotte in 1668) at which the optical nerve fibers leave the eye (*papilla fasciculi optici*), so that no photoreceptors are present at this point. It is located 12–18° nasally from the *fovea centralis*. Also known as the *optic disk*. K.H.P.

Marketing psychology. A branch of applied psychology dealing with the psychological laws of supply and demand and with their relations to one another.

Of its individual subdivisions, which are in part still comparatively independent (advertising, sales, product, consumer psychology, etc.), *advertising psychology* is still the largest. The reasons for this can be found in the connotations of the term, in history and

in economics. If the psychological processes underlying market events can be described almost entirely as those of *information* (q.v.) and *motivation* (q.v.), then advertising (which is designed only to inform and motivate) and advertising psychology must be important.

1. *History.* The history of the subject is involved and only an outline can be given here. The psychology of marketing has not developed independently as a result of academic interest, but under the pressure of the tasks with which the economic system faced psychology. Accordingly, the questions raised dealt not so much with fundamentals and relationships, but first and foremost with immediate application and applicability. The advertising world had already seen the psychological implications at the end of the last century, at least tentatively, and a psychology of advertising began to take shape. At first the questions raised were directed primarily to "precepts for action", but they also accorded with the psychology of the period. Until the present there has been a considerable time lag between the stage of psychological research and its transfer to the practical concerns of advertising. The individual advertising medium received the whole emphasis, and, in the light of the psychotechnics of that day, interest was shown in individual aspects such as the effects of "eye-catching quality", "emotional appeal", "impression on the memory", etc. It was only much later that these questions gradually became more wide-ranging: to "get across" to the public was the interesting point, and that raised the question whether the advertising medium correctly expressed motivation—whether it was suitable for the *article* and the *public*. But a reliable answer could only be given to these questions when the *advertising medium* ceased to be the sole center of attention, and the whole background of all public pronouncements made by the enterprise came under review. In this way, whole series of advertisements, entire campaigns, and the firm's whole style came under investigation, and the transition to examination of the

"public image" and motivation was made. At the same time the product itself received close attention; consumer appeal and how to "get it across" became increasingly important.

These questions were accommodated with difficulty under the concept of a psychology of advertising, and they are to some extent the reasons why some other part fields have come into being in this untidy area (product psychology and consumer psychology). It was soon realized that "advertising psychology" was not only a collective concept, but a general concept with its own theoretical foundation. Long before it had taken shape as a part discipline, advertising psychology had given rise to marketing psychology, on which it is now so dependent that it could not be meaningfully represented in isolation.

2. *Marketing and psychology.* The theory of economics is inconceivable without many psychological assumptions. As an aspect of human behavior, economic behavior, even with its supposedly rational basis, is just as much an object of psychology. True, it may be that psychology has little of *practical* import to contribute to a purely rational decision such as classical political economy postulates. But to take a decision or to act is always a matter for psychology.

In the past, in an economy of scarcity, there was no great need for a psychology of marketing, either in practice or in theory: very little supply, essentially restricted to basic commodities; a very great shortage of money on the part of the consumers, with an emphasis on supplying all one's own wants and on payment in kind; a minimal traffic in goods, with markets for a single product therefore very restricted in space and usually clearly demarcated from one another; little possibility of choice between competing goods; almost non-existent possibilities of switching to supplies of a different kind; etc. In such a situation the "rational principle" is almost completely valid. When there are *competing goods*, there are competitive prices, and these, as development proceeds and supply gradually increases, are equally gradually

overlaid—if not replaced—by competition in quality. At this juncture (at the latest), subjective criteria come into play.

The late capitalist phase, on the other hand, *is distinguished on the side of the suppliers* by high production amounting to surplus capacity, as a result of which the efforts of the supplier shift increasingly from production to selling; on the side of the consumers there is high income, which is designated as freely disposable; the “affluent society”, the “society of plenty”, is born. The goods provided for this freely disposable income are above all commodities *which are not vitally necessary*; services with a highly elastic demand are made available. The pressure of *consumer need is comparatively slight*, and the decision whether to buy or not to buy, whether to buy this or that, is seen to be a very “arbitrary” act. “Wandering purchasing power” can end up in certain sectors, but it can also shift quickly (*market fluctuation*). The supplier endeavors to put this fickleness of consumer behavior to good account, and to influence it by adding to *competition in quality and price* a superimposed *competition in image*.

The task of the psychology of marketing is to throw light on these “irrational” processes, and, as an applied discipline, to show how some influence can be exerted on certain movements—in the economy as a whole or in specific enterprises.

If, in the economy of scarcity, the naked and overwhelming pressure of need was the crucial dimension, this has now been replaced by a differentiated network of factors which determine the particular attraction of some offer on which the profitability of a business depends. The pressure of need in the economy of scarcity depends almost exclusively on the situation of the person concerned, but the attraction experienced by the consumer in the affluent society depends on *numerous factors* extrinsic to the individual, which are not even of an economico-rational nature (e.g. the character of the product, not only its objective character, but its *image*, the name and reputation of the manufacturer

and the tradesman; it depends on fashion, on the status of certain public figures who recommend the product). If the pressure of need could be neglected or taken as a universal basis, the attraction of the product no longer permits of such a wholesale theoretical approach. Marketing psychology has to replace “economic man” as a universal theoretical basis, with considered attention to the market as a social field.

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B. Spiegel

Market research. In principle—although at first it was not conducted in a scientific manner—market research became necessary from the moment when the practice of making single articles to order was superseded by the production of goods to be retained in stock.

In the present density and structure of often overlapping markets, and also because of the immense distribution machinery (commission agencies) which has now eliminated direct communication between buyer and manufacturer, market research represents an important instrument in the conduct of business, making it possible in places for the seller to pierce the increasing obscurity surrounding the market. According to Schäfer, its task is to carry out research into needs, the competitive situation and ways of effecting sales. One of its principal methods is *inquiry* (see *Interview*), but such a survey of psychic matters (need structures, motives, q.v.) requires to be completed by psychological methods (“interview in depth”, non-directive exploration, q.v., projective tests, q.v., experiment, q.v.).

The sharp contrast which at first existed

between the "quantitative approach" of market research based on figures and the "qualitative" methods of psychology gave way to a realization that the particular nature of the subject required proficient complementary studies from both angles. Hence the "quantitative" approach increasingly developed techniques to accommodate psychological data, just as the "qualitative" approach took more account of the quantitative point of view.

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Markoff chains. See *Stochastic processes*.

Markoff processes. Stochastic processes (q.v.) where the probability of an element (state) n is determined by the probability of the previous element (state) $n-1$. Markoff processes are therefore defined by the initial probabilities $p(X_1)$ and the transition probabilities $p_{x-1}(X_1)$ of all the elements. The transition probability is the conditioned probability of occurrence of the element X_1 under the condition $X_{(1-1)}$. *G.Mi.*

Marriage guidance. Introduced to prepare couples for married life. Its object is not merely to supply information about sex but also to show the importance of psychic, biological, legal, social and, last but not least, psychohygienic matters in married life and to explain possibilities, rights and duties.

In the last few decades, marriage guidance centers have been set up throughout the world which give information and advice about the possibilities of planned parenthood.

Matters requiring special attention in marriage guidance are the assessment of physical, psychological, mental and social health and maturity; the existence and cure

of psychological problems, personal and material difficulties; the evaluation of the role played by psychological disorders and their transmissibility, the assessment of any capacity to judge, and evidence of will power. Especial care is required before pronouncing on the possible desirability of marriage where there is already an extra-marital pregnancy. In such cases the officer responsible must be especially careful to refrain from any display of sentimentality.

In many places marriage guidance also includes preparation for marriage. This is a particularly delicate problem.

In every case the marriage guidance officer must put completely out of his mind any personal inclinations. It must be remembered that obvious anatomical, biological, physiological and psychological obstacles to marriage should certainly make marriage out of the question. However, no infallible method has as yet been devised to guarantee a successful marriage with complete certainty. This banal fact needs to be considered in all marriage guidance, which can therefore not disregard the personal decision of the two partners if they have come of age and are able to look after their own affairs, provided there is no conflict with the law. *A.F.*

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Masculine protest. Adler's term for a will-to-power, particularly domination of another, in either a man or a woman, although the term is sometimes used for a woman's strong desire to be a man.

Masculinism; masculinization. The display of the secondary sex characteristics of the male (*masculinity*) by a female. These masculine characteristics may be physiological or psychological, or both.

Masculinization: The process of becoming masculine, i.e. the adoption of male characteristics by the female. *G.D.W.*

Masculinity. The extent to which an individual manifests the behavior patterns, interests, attitudes, and personality traits considered typical of the male sex in a given culture. G.K.

Masking effect, acoustic. The information contained in an acoustic message (e.g. speech) can be drowned or "masked" by the simultaneous presentation of a second sound of suitable type and intensity. Most frequently the masking sound used in experiments is *white noise* (q.v.) C.D.F.

Masking effect, visual. If a second visual stimulus of appropriate content is presented shortly after a previous stimulus, then the first stimulus will not be perceived. Many experimenters have investigated this phenomenon paying particular attention to the interval between the stimuli and their content. C.D.F.

Masochism is a sexual anomaly consisting of excitement and orgasmic response to being in pain. More loosely, the term is applied to pleasure—not specifically sexual pleasure—derived from being offended, dominated, enslaved or otherwise maltreated.

According to convoluted Freudian reasoning, masochism is a primary function proving the existence of a self-destructive tendency. Primary masochism turned outward leads to sadism (q.v.), the destructive tendency which is normally present at the anal stage of sexual development but which itself may be again directed inward. This inward direction of sadistic impulses is thought to be characteristically feminine. Aggression (sadism) is permitted for men in our society but women are encouraged to repress this tendency: that is, to become masochistic, self-effacing, and slavish. Where masochism appeared in a man, Freud considered him to be essentially feminine. One consequence

of a masochistic need for punishment, according to psychoanalysts, is a strong resistance to therapy or a need for the suffering entailed in being ill. A. Broadhurst

Mass action principle. The principle that learning involves holistic functioning of all areas of the cortex. See *Aphasia*; *Brain pathology*; *Localization of psychological functions*.

Mass correlation. See *Product moment correlation*.

Mass media. Mass means of communication. A general term for modes of communication (channels or media, in communication theory) which can transmit the same information (messages) to a large number of individuals (receivers) relatively simultaneously.

The importance, distribution and effects of printed texts (newspapers, journals, books, comics, leaflets), radio, and audio-visual media (film and television) have been studied. The effects of records, sound and television cassettes, and wall newspapers and posters have not been studied in any detail.

Popular fears of manipulation (q.v.) by the media, and general opinions, attitudes and behavior patterns relating to mass media, contrast with empirical research results obtained by psychologists, sociologists and advertising experts. The findings show that mass communications rarely have a direct effect but frequently act through intermediary factors (e.g. persons, personal influence). They generally tend to reinforce rather than alter existing behavioral trends. Their effect is largely dependent on the characteristics of the factors involved in the communication process (source, message, receiver, intention). The importance of the mass media for giving new information and developing new forms of behavior, as well as for leisure organization, has been stressed. See *Communication*; *Media research*; *Attitude*.

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H.D.S.

Mass observation. A large-scale opinion poll. See *Opinion polls*; *Area sampling*.

Mass psychology. See *Crowd behavior*.

Mass reaction. The infant responds to stimuli with specific reactions, i.e. diffuse movements of his whole body. This form of reaction is caused by the early stage of development of the nervous system. Stimuli do not follow fixed paths but spread throughout the nervous system by a “mass reaction”. This term was introduced into the American literature by G. E. Coghill.
M.Sa.

Masson disk. A white disk with a radial series of black rectangles or squares which appear as concentric grey rings getting dimmer toward the outside when the disk is rotated. Originally designed for the study of brightness difference thresholds; now more often used to investigate attention phenomena. Certain levels of grey when fixated tend to disappear and reappear alternately.
G.D.W.

Masturbation. Manipulation of penis or clitoris, usually to orgasm. The term is often used for other auto-erotic techniques, such as fondling of the breasts or rhythmic body movements, etc. Orgasmic masturbation starts in approximately ninety-seven per cent of

males at the second puberal stage, and continues up to, and possibly beyond, the acquisition of a sexual partner. Nearly forty per cent of boys (fewer girls) indulge occasionally in mutual masturbation which is not of an essentially homosexual or morbid nature. At least fifty per cent of young girls, and many mature women, seek relief in the practice.

A taboo-ridden upbringing (especially that associated with ecclesiogenic neuroses, q.v.), while purporting to promote purity, often arouses intolerable feelings of guilt. Some would say that masturbation is a transitional “babbling” stage of love (I. H. Schultz). The frequency of masturbation depends on the strength of the drive, stimulus, inhibitions, etc., and is scarcely affected by a low-protein diet, sport or physical effort. Practiced with the partner, some think it indicates inadequate marriage relations. Scruples about masturbating involve some oversensitive, pious young people in the danger of suicide. It is anxiety felt about it, not the practice itself, that is harmful. Constructive advice on the subject should aim not at stopping the habit—always a futile endeavor—but at removing the attendant anxiety (if need be through expert hypnosis), explaining its normality, and diverting anxiety to constructive activities.

Bibliography: See *Coitus*; *Orgasm*.

K.T.

Matched group (syn. *Equivalent group*). One of two experimental groups showing the same distribution on a specific variable but exposed to varying experimental conditions.

Materialization. Supposed manifestation in quasi-material form of a deceased person at a *séance* (q.v.). See *Ectoplasm*.
J.B.

Mathematical psychology. 1. *Definition.* Mathematical psychology may be defined as psychological knowledge expressed in the

language of mathematics; Fechner's law is a classical example of this knowledge. However, the range of this discipline can be extended by exchanging the functions of the two concepts "psychology" and "mathematics" and describing the mathematical language which is able to express psychological knowledge (psychological mathematics).

This extension is, however, limited if we exclude the general mathematical procedures which do not have the special characteristics of application to a psychological problem, even if they are used in psychology. This is the case with statistical methods (statistical tests, variance analysis, multivariate analysis, etc.). The boundary becomes clear by stating that the theory of Markoff chains is not a part of mathematical psychology, whereas stochastic learning models are. By reason of convention, authors leave out certain aspects, generally because these have been given more specific attention elsewhere, and are effectively independent; this is true, e.g., of test theory (q.v.) and factor analysis (q.v.). Sometimes they go beyond the definition and introduce subjects which are clearly extraneous, e.g. in the *Handbook of Mathematical Psychology* by Luce, Bush & Galanter there are three chapters dealing with mathematical linguistics (e.g. the presentation of N. Chomsky's generative grammar).

2. *Development.* The origins of mathematical psychology can be traced back to 1860, when Fechner published his *Elements of Psychophysics*. For a long time afterwards there were few developments, apart from test theory and factor analysis. However, Thurstone's contribution (1927) on the law of comparative judgment should be mentioned; he tried to define the subjective interval between two stimuli by the number of judgments in which one stimulus was given a higher ranking. The true development began after the Second World War; it was inspired by information theory (q.v.) (Shannon & Weaver's book appeared in 1949), cybernetic considerations and the theories of decision and utility, etc. Since 1950 the

content of mathematical psychology has grown steadily, above all as a result of work done in the USA, where there is now a journal of mathematical psychology.

Having regard to other entries in the Encyclopedia (see *Methods of psychology, Information theory, Scaling*), mathematical psychology may be restricted to the following main headings:

(a) *Measurement theory.* Given a quantity of objects R and relations (or operations) $r_1, r_2, \dots$, we refer to the process of measurement as a transformation of R to the quantity N of real numbers, so that relations $n_1, n_2, \dots$ corresponding to $r_1, r_2, \dots$ coincide with the characteristics of the real numbers. After demonstrating the existence of a measurement method (representation theorem) we attempt to describe the quantity of transforms from R to N which enable the transition to be made from one numerical presentation to another: the quantity of permissible transformations. A few examples are given below:

(i) If R is associated only with equivalence relation E , the transform of R to N is possible precisely when the power of the quantity R/E of the equivalence classes is smaller than or equal to that of the continuum: any transformation of N to N is then acceptable. The process consists simply of numerical location through a nominal scale.

(ii) If R is associated with equivalence relation E and strict order relation P between the equivalence classes in infinite number, the transformation is possible precisely when the quantity R/E contains a partial quantity S which is dense in its order and also infinite. The number of legitimate transformations is that of the continuously rising transformations; the scale is therefore ordinal.

(iii) In the previous instance the order P was strict. Luce believes it would be interesting to introduce a partial order for subjective comparisons: e.g., given a quantity R of weights, let a subject be given two weights and asked which is heavier; if he replies *a is heavier than b*, we shall write $a \gg b$; the relation $\gg$ is a partial order relation; if two

very similar weights are given, the subject will be unable to reply because he cannot detect the difference. This relation is not trivial, because all intervals which contain an interval of perceptible difference are themselves intervals of perceptible difference. Let us now consider three objects x , y and z and assume that $x \gg y$ and $z \ll x$; if a fourth object w is heavier than x (objectively but not necessarily subjectively), then $w \gg y$; if w is lighter than x , we have $z \ll w$. It follows that if $x \gg y$ and $z \ll x$, then $w \gg y$ or $z \ll w$. It is also apparent that if $x \gg y$ and $z \ll w$, then $x \gg w$ or $z \ll y$. A semi-order is said to exist in the quantity R if there is a strictly partial order relation which has the two properties mentioned. It can be shown that there is then a strict order relation P to be defined as follows: we obtain xPy if $z \gg x$ also gives $z \ll y$ and if $y \gg z$ also gives $x \ll z$ (irrespective of the size of z). In general, there are no representation and uniqueness theorems for the semi-arrangements.

(iv) Even if it is already provided with the binary relations E and I , the quantity R can also be associated with the quaternary relation; this will be the case if the experiments provide answers to the following questions. Is the distance between a and b greater than the distance between c and d , or is c equidistant from a and b (central)? If we assume suitable properties for these relations (e.g. transitivity of the interval sizes or archimedean axioms in order to comply with the properties of the figures) we can prove the existence of a numerical representation and see that the linearly rising transformations form the quantity of acceptable transformations (see *Interval scale*). J. von Neumann has established axioms in a similar way which lead to cardinal numbers and introduce elements consisting of pairs (a and b) with a weighting or probability p and q ($p+q=1$).

(v) If we define an operation which transforms $R \times R$ to R (we define the sum of the two components of R as an element of R) and establish certain characteristics (axioms), we obtain an extensive value. We can show

the existence of numerical presentations which are defined up to a rising, linear, and homogeneous conversion (see *Ratio scale*).

(vi) Luce and Tukey have investigated *conjoint measurement*. If a quantity of pairs $R \times \rho$ with an order relation P is given, we try to obtain a numerical presentation $F(a, \alpha)$ in the form $f(a) + g(\alpha)$; the order relation for $R \times \rho$ would already allow conjoint measurement of R and ρ . The authors show that the assumption of 4 axioms is sufficient; the most important is the *cancellation axiom*. If a, b and c are three components of R , and α, β, γ three components of ρ , and if $(a\beta)P(c\alpha)$ and $(c\gamma)P(b\beta)$, then $(a\gamma)P(b\alpha)$.

(b) *Choice and decision*. Special attention has been given to the behavior patterns of choice. If a set R of objects $x, y, z, \dots$ is given, the behavior of a subject consists in selecting an object x from a finite sub-set T of R . Starting from experiments, we define the probability of choice: p_{xy} is the probability of selecting the object x in the pair (x, y) ; p_T is the probability that x will be selected in T ; $p_T^{(S)}$ is the probability that the component selected in T will also be present in S , a sub-set of T . We now set about arranging the objects by means of a specific numerical function $N(x)$, starting from the probabilities of choice. We decide to use one of the two following definition formulae for $N(x)$: (1) $N(y) - N(x) = \text{probit}/p_{xy}^x$ (in which the right-hand component is the standard value corresponding to the probability p_{xy}); (2)

$$\frac{N(y)}{N(x)} = \frac{p_{xy}}{p_{xy}^x},$$

suggested by Luce (we assume that p_{xy} never reaches 0 and 1). Use of these functions requires a condition to be met relating to the probability of the choice; in Luce's function this is the condition for multiplication:

$$\frac{p_{xy}^x}{p_{xy}^y} = \frac{p_{xz}^x}{p_{xz}^z} = \frac{p_{zy}^z}{p_{zy}^y}$$

Luce has shown that this condition is met when his axiom of choice is used: let S and T be finite quantities with the property

SCTCR; we then obtain for all elements x from S :

$$p_T^{(S)} \cdot p_S^{(x)} - p_T^{(x)} \cdot$$

An example is given by selection in uncertainty, e.g. in a lottery; in this case a decision to prefer one number to another is based on comparison of the mathematical chances of winning. If we turn to psychological experiments, this rule becomes a rule of maximum anticipated benefit, if the sums of money are replaced by the utility values and the objective probabilities by subjective probabilities; these concepts of utility and subjective probability have been widely studied. One example of application is the *signal detection* model of J. A. Swets, W. P. Tanner & T. G. Birdsall.

The experimental situation is as follows: in each trial the subject is asked whether or not he has noticed the signal; in some trials the signal is really given (before white noise)—this is case SB; if no signal is given we have case B (white noise only); we assume that during a trial the testee associates subjective probabilities with SB and B and attributes utility coefficients for all experiments in which the instructions are the same, to the four pairs B yes, B no, SB yes, SB no (“yes” and “no” are the possible answers); the model of the anticipated benefit shows that the testee’s reply is dependent on comparison of the relation of subjective probability with a certain expression of utility. If two appropriate standard distributions are imagined (with standard deviation = 1) which represent the frequencies of the cases XB and B as a function of the testee’s expectation (dependent on the ratio of subjective probabilities) we refer to the frequency of the reply “yes” in case B (false alarm) as p_1 and the frequency of the reply “yes” in case SB (correct answer “yes”) as p_2 ; it is apparent that probit $(p_2 - p_1)$ is a value which can be estimated and is not dependent on the degrees of utility, i.e. on the instructions; the value of the model can therefore be verified by changing the instructions.

Other models have been suggested, e.g.

with choice reaction situations in which different decision criteria and latency times are taken into account.

(c) *Learning psychology*. Let us consider the following simple situation: the subject participates in a series of experiments; in each experiment he gives one of the two replies a_1 or a_2 (e.g. the blue or red light will flash on), after which the experimenter provides the solution e_1 or e_2 (he allows the red or blue light to flash). If this solution appears with a probability which is not dependent on the subject’s replies we have what is known as an “independent” case, which we shall assume here. The models show the evolution of the subject’s reply frequencies, and primarily of the frequencies after stabilization; they give reply probabilities for the n th trial, and above all asymptotic probabilities (e.g. $p(a_1/e_2)$ is the probability of a reply a_1 after a solution e_2 in the preceding trial). A non-observable intermediate variable z is frequently used, known as the state of the subject. Frequently it is assumed that the number of possible states is finite; it may be said, e.g. that the test subject may be in the state z_0 , in which there is a probability 1 that he will give a_1 , in the state of complete uncertainty z_1 , in which there is a probability $\frac{1}{2}$ that he will give the answer a_1 , or in the state z_2 in which the probability of obtaining the reply a_1 is 0. We prepare a table of the transitional probabilities from one trial to the next (e.g. from z_1, e_1 in trial n to z_n in trial $n + 1$); at least in the independent cases we therefore have a Markoff process between the states, and we can calculate the different reply probabilities, which are then compared with the experimental frequencies. Another possibility consists in assuming that the number of states is not finite, and each state is characterized by the probability z_1^n of the reply a_1 in the n th trial; we assume that a linear operator enables z_1^n to be calculated if z_1^{n-1} is known. These models were developed by R. R. Bush & F. Mosteller. W. K. Estes & P. Suppes consider a special model, defined as follows:

We obtain $z_1^n = (1 - V)z_1^{n-1} + V$, if the solution to the experiment $n-1$ was equal to e_1 and $z_1^n = (1 - V)z_1^{n-1}$, if it was e_2 . A large number of stochastic teaching models of varying complexity have been developed to match different situations. It appears that Estes was the first author who managed to cover this subject in detail.

(d) *Social interaction.* In this case the formalization is based on various mathematical assumptions. In the first place graph theory is used to represent communications and connections between groups; an example of the notion which is useful in problems of communication analysis is given below: let R be the relation which defines the graph G ; aRb signifies that a is in a direct relationship to b ; if we now add the transitive relation R' to R so that when aRb we have $aR'b$, and when aRb and bRc we obtain $aR'c$; the graph $M(G)$, defined with R' , associates the transitive completion of G . $aR'b$ signifies that a is directly or indirectly related to b ; conversely, connections can be removed from G without altering $M(G)$, so that we obtain a minimal graph which has the same transitive completeness as G . Matrix representations associated with graphs are often used. In addition, systems of differential equations are used for formalization.

Let us consider a quite typical example, proposed by H. A. Simon to express G. C. Homans' hypotheses on group dynamics (q.v.). If I , F , A and E represent the intensity of the interaction, the degree of friendship, the level of activity and the activity required by the environment, we have:

$$I = a_1 F = a_2 A, \quad \frac{dF}{dt} = b(I - \beta t),$$

$$\frac{dA}{dt} = c_1(F - \gamma A) + c_2(E - A).$$

In this case, functions of the variables are inserted on the right-hand side; they are not precise but include partial derivations of a given sign.

Discussion of the different types of mathematical formalization is concerned primarily

with their significance in psychology. Do they represent isomorphic mechanisms of the different kinds of mental activity, or are they methods of approximation and prediction for observed results? Representatives of the second position quote examples of models which fit the same conditions and are at the same time based on totally different mathematical principles. See *Decision processes*; *Factor analysis*.

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J. M. Faverge

Mating center (syn. *Sex behavior center*). The central-nervous, neuroanatomical, functional center of gravity in the autonomic hypothalamus (primarily the *nucleus ventromedialis*). The mating center plays a decisive part in the development and control of sexual behavior, in conjunction with the hormonal-sex center (McCleary & Moore, 1965) which represents the main production center of the hormonal factors RF (releasing factors) and IF (inhibiting factors), which release, synthesize and inhibit the HVL hormones (location: hypothalamus, primarily in the *nucleus infundibulus*). The mating center becomes specifically male or female through sexual hormones during the embryonal stage (in man) or shortly after birth (in various mammals) = differentiation of the hypothalamus. Recent experiments in animals have shown that predominantly male or female sexual behavior in male and female animals is later triggered exclusively by a female or male hypothalamus, and not by a sex-specific sexual hormone (Dörner, 1968). Disorders in the period of this differentiation of hypothalamic centers have a strong influence on subsequent sexual behavior (in all previously examined species of mammal, differentiation or development of these

hypothalamic centers occurs after completion of the physical sexual differentiation, which occurs in man between the eighth and twelfth weeks of embryonal development). Recent research findings in this sphere have reopened the discussion as to the causes of sexually deviant behavior in man, e.g. homosexuality, transsexuality, etc.: disorders of hypothalamus differentiation dependent on the sexual hormones as a possible cause versus the theory of experience in early childhood as the cause of sexually deviant behavior (Neumann, 1970).

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Matriarchy; matriarchate. Theory developed by J. J. Bachofen (but no longer completely accepted) according to which a period of promiscuous sexual relationships as the first and original social form was followed by a matriarchate in which relationships were defined on a matrilinear basis. Hunters and collectors in ancient times did not in fact live promiscuously but primarily in stable monogamous marriages. Ethnological results cast doubt on the theory of Jung's school, according to which the matriarchate embodied an unconscious stage in the psychological development of man (and did not correspond to the supposedly "male" spirit) (E. Neumann). Recent archeological finds have shown that Bachofen was not wrong in his supposition that matriarchal social forms played an important part in the Mediterranean area in former times (Çatal Hüyük in Anatolia).

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Matrices test. Non-verbal intelligence test which in the opinion of its proponents covers

a general intelligence factor (see *Culture-free intelligence test; Progressive Matrices Test*). In these tests the subject is called upon to complete partial, rectangular figures, known as matrices. Several choices are offered and the correct one must be selected. Matrices tests are primarily used for intelligence testing of subjects suffering from speech defects. *P.S.*

Matrix. 1. Any two-dimensional composition of associated values. **2.** Mathematical: a form of representation for n parameters with m linear relationships; it is possible, e.g., to show linear equation systems in a matrix. The numerical solution to these equation systems presented in matrix form can be determined through the determinant. Specific rules of calculation apply in this case. The transposed matrix M . A' is a matrix which contains the same components as the matrix A , but is reflected around the main diagonal. An inverse matrix is one which plays a similar role in the matrix calculation to the reciprocal of a number in real number algebra. It is only possible in non-singular matrices, i.e. in matrices whose determinant is not equal to zero.

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Matrix algebra. A branch of algebra concerned with the formal treatment of matrices. Matrix calculation is dependent on specific rules, e.g. the multiplication of matrices is not commutative, i.e. in general $A \cdot B \neq B \cdot A$ holds good. *G.Mi.*

Maturation. An autonomous process of somatic, psychological and mental differentiation and integration spread over developmental stages and phases which condition and build on one another in the course of time; as a result of this process the individual's growth (see *Maturity*) is completed and

consolidated somatically, mentally and spiritually as well as socially, and he can thus adapt to life; in each stage of development four phenomena can be found: latent disposition (*anlage*, q.v.), "budding", real growth, inclusion in an organization which is effective as a whole. As organ and function systems, skills and abilities develop, the organism remains active in all its parts and the person continues as a whole.

The following stages are distinguished: *new-born baby* or *neonate* (the first ten days), *suckling* or *baby* (till the end of the first year), *infant* or *pre-school child* (until 5 to 6 years), *junior* or *child* (till 12 years), *juvenile* or *adolescent* (female till 17, and male till 18 years), the *growing person* or *young adult*, the *adult* or *mature adult* and the *old man* or *woman*. There is no general agreement about terminology and precise demarcation.

Somatic, psychic and social developments take place side by side or correspond to one another, but traditional notions of psychosomatic disintegration and senile decay have been corrected in the light of the findings of the most recent research into the psychology of aging (q.v.) and geriatrics (q.v.) (see *Gerontology*). Differences specific to human ontogenesis need to be noted. The absence of any development in the testicles or the ovaries from the third to the tenth or twelfth year while psychic differentiation is continuing enables man to experience childhood; the time lag between bodily growth and full sexual development during youth and the growing period, which is due to certain hormones, allows man time for learning and for social adaptation as preconditions for the evolution of civilization. The periods of *dependence* and *dysharmony* in all areas are favorable to psychophysical humanization, language acquisition and the establishment of relationships with other people; they are important factors in the development of the individual and the anthropological structure.

In man's development, autonomous maturation and exogenous education or learning

processes must blend harmoniously. For instance, a young child can learn to walk only when certain organs have matured, and thinking (q.v.) is possible only after the completion of the necessary growth in symbolic, perceptual, concrete and formal thought operations (see *Development*).

Maturation which is too rapid (somatic or psychic *acceleration*, q.v.) or too slow (*retardation*, q.v., *deceleration*) can often be the cause of discrepancy and dysharmony in bodily and mental and spiritual development, and it is also possible for individual phases of maturation to be too strongly emphasized endogenously, thereby causing marked disturbances in social adaptation. See *Adolescence*; *Child psychology*; *Educational psychology*; *Infancy*; *Youth*; *Adult psychology*.

H. J. Engels

Maturity. The state existing when somatic, psychic and mental differentiation and integration (see *Maturation*) are complete and consolidated, and when there is readiness to fulfill tasks facing the individual at any given time and to cope with the demands made by life.

While in Central Europe girls have reached sexual maturity at 15½ years of age and boys at 16 years, complete *somatic* maturity cannot be said to exist before the age of 17, and possibly not until 21.

Psychic maturity is shown in adolescent females at the age of 17 years, and in adolescent males at the age of 18, by the fact that their aspirations and will have reached lasting stability, and the search for a theme in life is over.

Social maturity in the case of growing females is reached at the age of 22 and in the case of males at the age of 24. It is marked by the appearance of a positive creative urge and the recognition of the supra-individual aspects of the socio-political life, to which may be added their final harnessing to some goal and fusion of sex and eros. The process of detachment from the parents and the still persisting state of exclusion from the civilizing but

complicated adult world, as well as the divisions into groups of tyrannical and leveling sub-cultures are overcome. The individual, differentiated in body, mind and spirit and integrated in a personal whole, is ready for the community and the civilization in which he finds himself. From ancient times, people in Europe were said to have come of age on completing their twenty-fifth year; for example, that was the *legitima aetas* for the priesthood of the Roman Catholic Church, the right of the master-tradesman to train apprentices, and for full membership of guilds, companies and brotherhoods.

In all known civilizations some special ceremony has served to mark the attainment of certain degrees of maturity (confirmation, the knightly accolade, etc.).

Experience has led social bodies, collectivities and organizations to link certain degrees of maturity with definite ages, yet there have also been cases where arbitrary dates have been fixed, such as, for example, the lowering of the voting age, etc.

H. J. Engels

Maturitas praecox. Premature maturation, in particular of the sex organs (see *Pubertas praecox*). Children appear adult in their whole form of action. Their movements are often deliberately slow and their language is characterized by carefully chosen formulations which are not those of normal children. They are often concerned with religious or philosophical problems which are usually the preserve of adults.

M.Sa.

Maudsley Personality Inventory. Developed by H. J. Eysenck in 1956. 24 items characteristic of neuroticism (N) and extraversion (E) have been selected on the basis of correlation-statistical criteria from the MMQ and tests of J. P. Guilford. (A short scale for market research purposes consists of 6 items for N and 6 for E.) The total values of

the N and E scales are interpreted. The halving reliability is $r = 0.88$ for the N scale and $r = 0.83$ for the E scale. The coefficients for the short scale are $r = 0.79$ (N) and $r = 0.71$ (E). The validity of this inventory has been confirmed on the one hand by significant discriminations between normally healthy subjects and clinical groups, and on the other by major correlations between the MPI scales and other tests of the same personality dimensions (for $E_r = 0.35-0.80$; for $N_r = 0.34-0.77$). See *Eysenck Personality Inventory*.
P.G.

Maximum effect. The phenomenon (which can be explained psychologically and by information theory) according to which a sign in a given field necessarily assumes a maximum obtrusiveness when it occurs with the relative frequency $p = 0.37$. The maximum effect was first described by H. Frank and used to explain esthetic processes. H.R.

Maximum likelihood method. A method of statistical estimation introduced by R. A. Fisher. In this method a value is chosen as the estimation of the parameter of a data quantity at which the probability of the observed data quantity reaches a maximum. In many cases the maximum likelihood method gives estimates of maximum accuracy, i.e. with lowest standard error.

Bibliography: Fisher, R. A.: Theory of statistical estimation. Proc. Cambr. Phil. Soc., 1925, 22, 700-25.
G.Mi.

Maxwell disks. The colored disks, split along the radius so that they can be overlapped in varying proportions, which are rotated on a *color wheel* in experiments on *color mixture*.
G.D.W.

Mayer's waves. More or less periodic fluctuations in blood pressure which are due to vegetative sources and generally reflect physiological retardations in the blood

pressure regulating mechanisms. With a cycle duration of ten or more seconds they can be distinguished—as blood pressure fluctuations of the third order—from respiratory fluctuations of the second order and heart frequency dependent fluctuations of the first order; they are linked with fluctuations in heart frequency and influence cerebral activity and awareness. *E.D.*

Maze. An experimental system used in human and animal learning and in instrumental conditioning of animals. After finding the correct pathway among the blind alleys, the animal is rewarded at the goal. Learning increments are shown by the increased speed of a run on repeated tests, and by avoidance of blind paths. One variety used with humans requires the blindfold subject to trace the maze with his finger. *P.S.*

Maze test (syn. *Labyrinth test*; *McCollough effect*). A specific color aftereffect described by C. McCollough (1965) and named after her.

After repeated, alternating presentations of two colored strip patterns, e.g. with vertical red and horizontal green stripes, the bright stripes in a vertical black and white striped pattern appear greenish; in a horizontal stripe pattern they are pink to red. The maze test is one of the more recent aspects of research which require cooperation between neurophysiologists and perception researchers. The effect is explained by the shape and color-specific organized, receptive fields in certain cortex neurons of the visual cortex (areas 18 and 19).

Bibliography: McCollough, C.: Color adaptation of edge-detectors in the human visual system. *Science*, 1965, 149, 1115–16. Hajos, A.: Verlauf formspezifischer Farbadaptationen im visuellen System des Menschen. *Psychol. Beitr.* 1969, 11, 95–114. *A.Ha.*

McDougall, William. B. 22/6/1871 in Lancashire; d. 28/11/1938 in Durham, frequently

called himself arrogant. Some such quality of unsparingness with himself and others seems to be the key to a life of productivity and conflict. Of mixed English and Scottish (Highland) descent, educated at a German Gymnasium and at the Universities of Manchester, Cambridge (Scholar and Fellow of St John's College) and Göttingen, and at St Thomas's Hospital, London, he was a scientist and physician with an exceptionally wide background, aiming for the highest and getting nearly all he aimed for. Yet involvement in a tragedy set him to traveling (the Torres Straits Anthropological Expedition, issuing in productive field-work). As Wilde Reader in Mental Philosophy at Oxford he encountered opposition to his subject and to himself. His work in military psychiatry (World War I) he found rewarding but conflict-ridden. His move to the USA (1920) led quickly to confrontation through his incautiousness in lectures on public affairs. His involvement in parapsychology and his experiment on the inheritance of acquired characteristics were not accepted by others as by himself. McDougall began as a physiological researcher, and produced a text of merit (1905). But his speculative and scientific bents conflicted with each other, issuing in the pioneering *Social Psychology* (1908), and later in the unfortunately titled *Group Mind* (1920). Yet he also systematized with some success (*Outline of Psychology*, 1923), and produced an *Abnormal Psychology* (1926), still useful. His *Body and Mind* (1911) (argument for animism) shows his methodical advocacy of unpopular causes, and makes it difficult to believe those who claimed him as a behaviorist on the strength of *Psychology: The Study of Behavior* (1912). (His logomachy with J. B. Watson settled any such question.) Later works were mostly (e.g. *Character and the Conduct of Life*, 1927) application and popularization. McDougall is remembered intellectually for his advocacy of: hormic psychology (behavior involves purposive goal-striving, is not completely explicable in mechanistic terms); instinct (a theory of

innate propensities, linked to emotions); sentiments (ordered systems of emotions, especially the self-regarding sentiment); and the "group mind" (an organized system of interacting energies, operating through the whole group). McDougall thought and lived his psychology more than most—"As a departmental chief he was beyond compare" (Adams, 1939). His work was for long influential, and in part may well be due for refinement and revaluation.

Main works: An introduction to social psychology, London, 1908 (³⁰1950). The group mind. Cambridge, 1920. Autobiography, in: Murchison, C. (Ed.), A history of psychology in autobiography, Vol. 1. Worcester, Mass., 1930, 191–223.

Bibliography: Adams, D. K.: William McDougall. Psychol. Rev., 1939, 46, 1–8. J.A.C.

McNemar test. A non-parametric method of testing the difference between two correlated distributions of alternative characteristics. For statistical testing purposes we determine:

$$\chi^2 = \frac{(b - c)^2}{b + c} \quad (df = 1)$$

in which *b* and *c* are the frequencies in the diagonal cells of the correlation schema. The χ^2 applies to the difference between the peripheral summed distributions in this schema.

Bibliography: McNemar, Q.: Note on sampling error of the differences between correlated proportions or percentages. Psychometrika, 1967, 12, 153–4.

G.Mi.

Mean. 1. The *arithmetic mean* (q.v.). **2.** A measure of central tendency.

Meaning. A much discussed philosophical concept, which is highly ambiguous in psychology too. In particular, meaning denotes the connection between sign and signified; and, in more general usage, the signified. Analysis of context is obviously

important if the meaning of meaning is to be elicited proficiently.

Meaningfulness: (according to R. Bergius) the "co-references of the concept to other data of the same or other classes". Meaningfulness is crucial in determining to what extent certain matter can be learnt.

Measurement of meaning, in the sense of connotative meaning, is chiefly carried out by two methods: (1) determining the association value (Noble, 1952): the number of associated words in a short (2"–3") and longer (7") period is determined; (2) by C. E. Osgood's semantic differential (q.v.) (P. R. Hofstätter: polarity profile, q.v.).

Bibliography: Bergius, R.: Einfache Lernvorgänge. Handbuch der Psychologie, Vols 1 & 2. Göttingen, 1964, 153 ff. Noble, C. E.: An analysis of meaning. Psychol. Rev., 1952, 59, 421–30. Ogden, C. K. & Richards, I. A.: The meaning of meaning. London, 1923, ⁸1946. H.-J.A.

Mean quartile (syn. *Quartile deviation*). A statistical characteristic for the dispersion of distributions. The mean quartile is represented symbolically by *Q* and is used as a dispersion measurement for ordinal variables; it represents half the distance between the third (upper) and first (lower) quartile. G.Mi.

Means-end relationship. A concept associated with the American learning theorist E. C. Tolman and his school of "purposive behaviorism". An object, distance, direction, etc., intervening between a means and an end (goal) which is known to the animal as a result of previous experience in the field, and is therefore a partial determinant of its behavior. G.D.W.

Mean square. The average of the squared values in a distribution. The mean square is an intermediate value which can be employed usefully for different calculations, e.g. in determining variances or in variance analysis. G.Mi.

Mean square deviation. See *Standard deviation*.

Mean values. Statistical characteristics for the central tendency of a distribution. The best known are the arithmetic mean, the median or central value, the mode, the harmonic mean and the geometric mean. Selection of the most suitable mean value to characterize a distribution is dependent on the nature of the investigated variables and on the form of the distribution. *G.Mi.*

Mean values, comparison of. The test of the difference between the characteristic values of the central trend of two or more distributions to determine statistical significance is defined as the comparison of mean values. In the case of variables with a normal distribution it is carried out in a dual sample test with a t test, or, if there are more than two samples, by variance analysis using the arithmetic mean values. In variables without normal distribution, other characteristics are compared with the central trend (e.g. median test). *G.Mi.*

Mean values, distribution of. If a number of independent samples are taken from a population, the mean values of these samples (M_1 , M_2) are distributed with a standard deviation more or less normally around the population mean value, even if the values of the populations are not normally distributed. *G.Mi.*

Mean variation. A measurement which is used occasionally to describe the dispersion of distributions. It is the average value of the absolute deviations of the measured values from their mean. See *Standard deviation*. *G.Mi.*

Measured values. Quantitative values determined by measurement which show the degree of emphasis of a specific characteristic.

Measured values may be on the quantification level of ordinal, interval or ratio scales (see *Scaling*). Derived measured values are obtained by mathematical operations to characterize the intensity of the feature concerned (e.g. percentages). *G.Mi.*

Measurement is the attribution of numerical values to objects so that specific relationships between the values correspond to similar relationships between the values correspond to similar relationships between the objects. Measurement in the narrower sense of the word presupposes a continuously variable characteristic of the object. *G.Mi.*

Measurement in psychology. In contrast to the classical natural sciences, psychology does not have at its disposal a uniform system of measurement. At the present day, the various aspects of behavior which are of psychological interest appear to be so incommensurable that very few, if any, attempts are now made to apply a uniform method of measurement to the individual psychological disciplines. That is why, in the course of the history of psychology (q.v.), different methods of measurement have been evolved for different areas or fields of psychology. Thus, in psychophysics (q.v.), for example, scaling methods (q.v.) are chiefly used, neuropsychology measures with the methods of physiology (chemistry and physics, etc.), and finally, experimental psychology (q.v.) and psychodiagnostics (q.v.) use very diverse methods of measurement which are described under the appropriate terms. See *Test theory*; *Psychometrics*. *R.Hä.*

Measurement theory. The theoretical basis of measurement, i.e. the representation of a quantity of given objects and the empirically observable relationship between them as a quantity of numerical values and relations between the latter. Measurement theory

indicates the conditions (assumptions, peripheral conditions) under which an empirical relative value can be converted into a significant numerical relative value with the help of specific models (measurement models). Psychologists have always devoted considerable interest to measurement theory because of the problems which arise in recording psychological variables.

Bibliography: Suppes, P. & Zinnes, J. L.: Basic measurement theory. In: Luce, R. D., et al. (Eds.): Handbook of mathematical psychology, Vol. 1. New York, 1963. Lord, M. R. & Novick, F. M.: Statistical theories of mental test scores. Reading, 1968.

W.-H.B.

Mechanical learning. See *Learning, rote; Memory.*

Mechanism. 1. See *Determinism* (4 & 5). 2. A stimulus-response system. 3. A machine or system with the predictability and limitations of a machine (see *Machine learning*). 4. A habit (q.v.). 5. A drive (q.v.), instinct (q.v.) or motive (q.v.).

Mecholyl test. A functional test proposed by D. H. Funkenstein (Funkenstein test) to determine the reactivity of the autonomic nervous system. The cholinergic substance methacholine chloride (Mecholyl) is administered intravenously to the subject. The extent and duration of the blood pressure reduction is taken as the determining factor. The test does, however, offer only limited reliability. The blood pressure reaction alone cannot be considered as a measurement of autonomic reactivity. The relationship between reaction and therapeutic success determined by Funkenstein has not been definitely confirmed. [N.B.: *Mecholyl* (methacholine chloride) is not now manufactured.]

Bibliography: Funkenstein, D. H., Greenblatt, M. & Solomon, H. C.: An autonomic nervous system test of prognostic significance in relation to electroshock treatment. *Psychosom. Med.*, 1952, 14, 347-62. Rose, J. I.: The Funkenstein Test—a review of literature.

Acta. Psychiatr., 1962, 38, 124. Stenback, A. & Rilva, P.: The use of histamine and methacholine in testing autonomic response. *J. Psychosom. Res.*, 1964, 111-18.

W.J.

Median (syn. *Central value; 50th centile*). A statistical characteristic for the central trend of a distribution. The value which divides the distribution into two identical halves so that 50% of cases are situated on either side is said to be *median*. In the case of non-symmetrical distributions, the median characterizes the central trend more adequately than the arithmetic mean since it is not influenced by extreme values.

G.Mi.

Media research. A branch of mass communications research which is concerned with those aspects of the mass media (radio, television, newspapers, etc.) which are of significance in advertising. The areas of study are (a) the range and socio-demographic and psychological structure of those reached by the media; (b) the consumption and media utilization habits of those persons; (c) the features of the media which are relevant to publicity (media image); (d) the interaction between the advertising message and medium and the effects of variations of placing and density of inclusion of advertising in the media. See *Mass media*.

H.H.

Mediator. 1. An intervening system receiving and transmitting information (q.v.). 2. One who assists two or more alienated individuals or groups to come to terms.

Meditation. I. The word "meditation" is derived from the Latin *meditari*, meaning both to "practice" and to "reflect". Meditation may therefore be defined as the practice of reflection. More precisely, it is the internalization process by which a man becomes aware of his deepest self and the ground of this self. It is a universal human experience. Both *cognitive* and *affective* faculties are

involved, as is the body, whose posture is most important for successful meditation. The goal of this total involvement is to experience its object and not merely to contemplate it. Meditation is not the thoughts about actuality that a man might have, but a union with, and being grasped and even overwhelmed by, that reality. Rational thought can evaluate or prepare for this experience, but can never substitute for it. Yet the experience is not "thoughtless" or irrational. It involves a mode of thought which is not analytic but comprehensive and contemplative, and may therefore be called *pre-rational* or *supra-rational*. In meditation one becomes aware of one's deepest *self* (q.v.), which enables one to come to oneself, to find oneself, and be at one with self. This process of internalization is a universal human phenomenon occurring both in the pre-Christian East and in the Christian West; it has developed in different ways and stages.

1. *Meditation and related concepts.*

(a) *Observation or simple contemplation*, in contrast to meditation, is principally concerned with rational knowing about, or thinking about; it analyzes its objects discursively. Yet the more mature it becomes, the more it approaches meditation. Eventually it passes into, or (better) is *transformed into*, meditation.

(b) *Therapeutic or religious meditation*. In *therapeutic* meditation, the divided man seeks to regain possession of his self (q.v.) or unity with himself—which does not exclude union with the "ground of being". In *religious* meditation, a man seeks union with the ground of being; this presupposes union with himself, and culminates in the surrender of this found self to the ground of being. In the one case, it is a question of the *healing* of a sick man; in the other, of the *sanctification* or salvation of a sinful man. Sin is here understood as being cut off or absent from the ground of being.

(c) There is a distinction between the *monist* and *non-monist* views of meditation. The monist view explains the experience of union

as signifying that all men and things are expressions of the one ground of being, to which they return and into which they dissolve like the waves in the sea. The non-monist form experiences in this union the particularity of things and especially of human beings; the more personalized the self of a man, the more closely he is at one with the ground of being. This is the basis of the distinction between the non-personal (monist) interpretation (held particularly in the East) and the *personal* (approaching the Christian) view of meditation.

2. *History of meditation in the West*. One might begin with the Platonic "union with God" (*Symposium*, 210e/211b), and Plotinus (*Enneads*, VI 9.11). The influence of neo-Platonism (as brought to fruition by Plotinus) was far-reaching in Christianity; it extended from Augustine (d. 430) to (especially) Meister Eckhart (d. 1327). Meditation is usually connected with supernatural mysticism (q.v.); particularly with St John of the Cross (d. 1591). The Reformation, rationalism and the Enlightenment were not favorable to the broad stream of meditation running through the Middle Ages up to the beginning of the modern age. However, it has gained new life in recent decades, both in the Catholic (Dessauer, 1961; Lotz, 1961) and in the Protestant traditions (Happich, 1948; Melzer, 1957), and has been enriched by the heritage of the East (Déchanet, 1968; Dürckheim, 1971). Methods of meditation were developed both in the East (Zen Buddhism and Yoga) and in the West (the Spiritual Exercises of Ignatius of Loyola). Although meditation corresponds to the deepest needs of human nature, and often arises spontaneously, the externally oriented Western man sometimes needs appropriate training (see *Meditation* II). If we inquire into the psychological basis of meditation, we find that the rational and conceptual idea of understanding is primarily important in the modern sciences, but not in the meditative or "contemplative" life, which arises from the pre-conceptual imagination, in which myth

(q.v.) and art are rooted. Its basis is supra-conceptual comprehension by the mind directed toward the transcendental (mystery) whence we derive philosophy and religion. See *Religion, psychology of*.

Bibliography: Bitter, W. (Ed.): *Meditation in Religion und Psychotherapie*. Stuttgart, 1958. Déchanet, J. M.: *Christian Yoga*. London, 1968. Dessauer, P.: *Die naturale Meditation*. Munich, 1961. Dürckheim, K.: *Im Zeichen der grossen Erfahrung*. Munich, 1951. Id.: *Durchbruch zum Wesen*. Zürich, 1964. Id.: *The way of transformation*. London, 1971. Happich, C.: *Anleitung zur Meditation*. Darmstadt, 1948. James, H.: *The varieties of religious experience*. Cambridge, Mass. & London, 1902. Knowles, D.: *The English mystical tradition*. London, 1964. Lotz, J. B.: *Meditation im Alltag*. Frankfurt, 1961. Id.: *Der Mensch im Sein*. Freiburg, 1967. Id.: *Einübung ins Meditieren am NT*. Frankfurt, 1968. Melzer, F.: *Meditation in Ost und West*. Stuttgart, 1957.

J. B. Lotz

II. Eastern meditation. Meditation is important in the East as a typical religious exercise. It has existed in India and China, the cradles of Asian culture, from the earliest times. The general name for meditation and meditative techniques in India is *Yoga* ("to bind together", "to yoke together"). A distinction is made between the yoga of knowledge (*jnana yoga*), of loving surrender (*bhakti yoga*), and of dutiful behavior (*karma yoga*). The relatively late *yoga sutra* (fifth century A.D.) names the eight steps of the way of Yoga, which are the requisite somatic and psychic behaviors. *Buddhism* has been linked with Yoga from its beginnings. In Theravada Buddhism (in Ceylon and South East Asia) meditation is joined with Yoga. The meditation texts of the Pali canon enjoin training in attention and concentration (*satipatthana*). In China, partly under the influence of Chinese meditation (particularly the Taoist form) various modes of Buddhist meditation developed: e.g. *mandala* meditation (visual concentration upon a symbol with a transcendental meaning); *amitabha* meditation (concentration upon the image or upon the names of the Amitabha Buddha, repeated in many invocations); and (most important in

Mahayana Buddhism) Zen meditation, which began in China (sixth century A.D.) and reached maturity in Japan (from the thirteenth century). The Japanese word *zen* means literally "sinking" or "submersion". The two characteristic practices of Zen, *zazen* and *koan*, are intended to induce concentration. *Zazen* (= sitting in meditation) in its bodily prescriptions (a specific position with legs folded, rhythmic breathing and exclusion of sensory images, emotions and processes) is very similar to the first steps of classical Yoga, but its purpose goes beyond quietness to enlightenment. The practice of *koan*, which is often a paradoxical and intellectually insoluble task, creates a high level of concentration to prepare for the breakthrough to experience. In Zen enlightenment it is the self which is experienced, the self grounded in the ground of being and bound up in the All. The experience gives a spiritual contact with absolute reality; it has different levels of intensity, and is accompanied by strong emotions; it is experienced as a psychic liberation. Among the many other forms of meditation found in the East are *Vendanta* in Hinduism, and the Confucian and Taoistic modes in China.

The basic characteristic of Eastern meditation is the close connection of somatic and psychic elements in the process. Body posture and rhythmic breathing are held to be necessary conditions for inner realization. The anthropological concept of the unity of body and spirit in man is present, though not necessarily reflected upon, in all Eastern meditation (see *Mind-body problem*). The integration of the unified human nature reveals the way to realize the self. Moreover, Eastern meditation postulates an experience: the total (objective and subjective) experience of reality. In some (though not all) forms of Eastern meditation, intuitive knowledge is primary; in all forms a man's physical and psychic faculties are wholly applied. Sensory means are used to attain outer and inner concentration (besides body posture and rhythmic breathing, e.g. visual fixation on a

point or symbol, observation of bodily processes, etc.). However, in transcendental meditation a man goes beyond the conscious ego and the objective environment to reach a state of immersion. This is a state of having broken through the world of the senses and the changing consciousness toward transcendence. In all Asian countries, meditation is regarded as a religious practice not only because of its goal but because of the ascetic struggle which accompanies it, and its place in the cult. The experience of meditation seeks liberation from ties to the phenomenal world, the fulfillment of human existence, and contact with absolute reality. The experience itself is always inexpressible; it is interpreted according to the religious and metaphysical situation of the meditating person. In Asia the interpretation is usually humanistico-ethical and cosmico-monist, although (particularly in India) theistic interpretations are also offered. In recent decades, Eastern meditation has won popularity in the West. This explains the efforts which have been made recently to introduce the techniques and methods of Eastern meditation (especially Yoga and Zen) into Christian spirituality.

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H. Dumoulin

Medium. In spiritualism: person through whom communications purporting to come from deceased persons are obtained. Such communications are usually oral but may also be written. See *Automatist*. *Trance medium*: a medium who functions in a state of trance (q.v.). *Physical medium*: a medium who produces paranormal physical effects. *Materializing medium*: a medium who produces materializations (q.v.). J.B.

Medulla oblongata. The extended medulla which—as the myelencephalon—forms the section of the brain which joins the remainder of the brain to the spinal medulla, and is situated in the area of the nape of the neck. In addition to important motor (efferent) and sensory (afferent) nerve paths, the *medulla oblongata* contains many vital central areas (synaptic commutations) such as the respiratory, circulatory and other regulating centers. All life processes cease immediately if it is destroyed. E.D.

Megalomania. The state of having delusions of *grandeur* (q.v.). It does not imply the presence of mania used either as a disease label or as a descriptive term. B.B.

Meier Art Judgment Test. A test for assessment of an aspect of artistic ability—artistic judgment. The subject is presented with one hundred pairs of pictures for comparison (a reproduction of an acknowledged masterpiece and a slightly altered, inadequate copy), and has to select the esthetically better one. S. is rated according to the number of appropriate choices. H.J.A.

Meinong, Alexius. B. 17/7/1853 in Lemberg; d. 27/11/1920 in Graz. An Austrian philosopher and psychologist and pupil of F. Brentano (q.v.). From 1882 until his death,

Meinong was Professor of philosophy at the University of Graz; in 1894 he founded the first Austrian psychological laboratory and was the main representative of the Graz school (q.v.), which included C. von Ehrenfels (q.v.), V. Benussi and S. Witasek.

Meinong's philosophical views grew out of Brentano's philosophical psychology. His most important contribution to philosophy was his "theory of objects". According to the experiential condition, i.e. imagination, thinking, feeling and desire, Meinong distinguished four classes of object: the object proper, the objective, the dignitative and the desiderative. An object (that which is "intended" by thought) may "exist" or "subsist". Meinong's contributions to psychology often approximate to gestaltist ideas. In his work on the psychology of complexions and relations (1891) he treated the same theme examined shortly before by Ehrenfels in his work on gestalt qualities. In philosophy, Meinong's emphasis on concepts not as abstractions but as "objective realities", and his analysis of assumptions (*Annahmen*), had considerable influence on Bertrand Russell.

Main works: *Über Annahmen*, 1907. *Über die Stellung der Gegenstandstheorie im Systeme der Wissenschaften*, 1907. *Über Möglichkeit und Wahrscheinlichkeit*, 1915. *Gesammelte Abhandlungen*, Vols. 1-3, 1914.

Bibliography: Martinak, E.: *Meinong als Mensch und Lehrer*. Leipzig, 1925. Russell, B.: *Introduction to mathematical philosophy*. London, 1919. *Id.*: *The analysis of mind*. London, 1921. *W.W.*

Meissner's corpuscles. Receptors for pressure detection. Located in the papilla of the dermis and particularly numerous in the fingertips. Length about 1/10 mm, width about 1/20 mm. See *Sense organs*: skin sense.

H.L.

Mel. A unit of a ratio scale for subjective judgment of pitch (q.v.).

Melancholic type. A slow temperament with a tendency to depression or fanatic idealism. A medieval term. See *Type*.

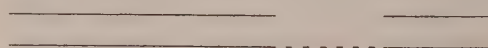
Bibliography: Müri, W.: *Melancholie und schwarze Galle*, Mus. Helv., 1953, 10; 1953, 21. *W.K.*

Melatonin. A hormone present in high concentrations, primarily in the pineal gland. It is, however, probably formed at several different points and not in the epiphysis itself. Melatonin can be considered as the cell and tissue hormone and is chemically related to serotonin. It is antagonistic to the melanocyte stimulating hormones (MSH) which foster the formation of skin pigments. It is very probable that melatonin plays a part in regulation of the circadian rhythm. There are close relations with the sex gland hormones; this is shown, e.g. by pineal extirpation and tumors.

Bibliography: Reiss, M.: *Neuroendocrinology and psychiatry*, a critical assessment of the present status. *Int. J. Neuropsychiat.*, 1967, 3, 441-63. *W.J.*

Mellinohoff's illusion. In this illusion the dotted line is in fact a continuation of the lower of the two parallel lines, but appears to be at a higher level between the parallel lines.

C.D.F.



Melody. A rhythmic succession of musical notes perceived as a meaningful unit. The smallest components of the melody are known as motifs. The esthetic effect of the melody and its significance in the context of larger forms as a theme are based essentially on the unitary character maintained in certain transformations (e.g. by transposition, rhythmic enlargement and reduction, reversals). The melody as an independent quality which extends its component parts (von Ehrenfels) was a primary example in the development of the gestalt concept. See *Ganzheit*. *B.Sch.*

Membership group. See *Group*.

Membrana tympani. The tympanic membrane, which is stretched at an angle across the end of the outer auditory passage. It transmits the sound oscillations through the auditory ossicles to the inner ear. The membrane is a roughly circular disk with a diameter of about 1 cm and a thickness of about 1/10 mm. A distinction is made between a small, loose area (*the pars flaccida*) and a large taut section (*the pars tensa*). The following tissue layers of the membrane are encountered from the outside inward: the *stratum cutaneum*, the *stratum radiatum*, the *stratum circulare*, while the inner termination is formed by the *stratum mucosum*, which consists of a mucous membrane. See *Sense organs*: the ear.

Bibliography: Couplan, R. E.: *Gray's Anatomy*, London, 1967. G.A.

Memories, first. The earliest childhood memories (of an adult). Memory capacity is already observable on the first day of a child's life, but memory matures slowly and events can be remembered over an extended period of time only after the third year of life. The earliest (material) memories extend back to the end of the second year of life (see *Repression*; *Freud*). K.E.P.

Memory (Retention). I. A memory is an organism's unwritten record of some past event. The experimental study of memory deals with the composition of memories, their interaction, and the processes which occur over a period of time and produce forgetting as measured on retention tests. The German psychologist Ebbinghaus (q.v.) first developed laboratory methods for studying memory in 1885, and provided the first quantitative law for the rate at which memories fade with time.

1. *Methods.* Superficially, the experimental study of memory appears simple. First, to gain initial control of a memory, it is established in the laboratory by giving learning trials on a task, say, a list of words. After a period of time, the memory is measured by asking S. to recall (reproduce) the words. The number recalled is usually less than could be recalled immediately after learning. If the retention interval is further lengthened, still greater *forgetting* will be observed. But, that forgetting occurs over time needs no demonstration; this observation merely defines the problems. What causes the decline in performance? Do all memories fade at the same rate? As will be seen, attempts to answer such questions frequently require somewhat more complicated experimental procedures.

A basic fact is that the better a task is learned—the more firmly a memory is established—the slower the rate of forgetting. Most people know from experience that this is true. However, consider the question about the rate of forgetting for different kinds of tasks. A list of words is said to be highly meaningful as compared with a list of nonsense syllables (e.g. QUF, RUW, BOC). Which will be forgotten most rapidly? Initially, learning trials are given on each type of list. If the same number of trials is given on both lists, the strength of the memories will differ because learning occurs far more rapidly for a list of words than for a list of nonsense syllables. Given this, it would be expected that retention would be better for words than for syllables. Such a procedure doesn't tell us whether this difference in retention is due to the difference in level or strength of the established memories, or whether the syllables are forgotten more rapidly, or both. Obviously, if we are to discover which is forgotten more rapidly, the memories for the two types of lists must be equal in strength prior to the retention interval. When such equality is established, it is found that there is little if any difference in the rate of forgetting of different materials. A list of common words, very quickly learned, will be

forgotten as rapidly as a list of nonsense syllables which are learned very slowly. But, both are forgotten. Why?

2. *Interference.* One of the factors long believed to be critically involved in the loss of memory with the passage of time is interference from other memories. This belief rests on hundreds of experiments in which interference between and among memories has been studied. The techniques of study are so fundamental that some detail is justified. Paired-associate lists may be used to illustrate a way of introducing interference. With these lists S. learns a series of response terms to a series of stimulus terms. For example, he must learn to respond with LAW when COW is presented, to respond with PEN when RUG is presented, and so on. The words COW and RUG are stimulus terms; LAW and PEN response terms. Ten to twelve such pairs may be used in a list and on successive learning trials the pairs are presented in different orders. Now, assume S. has learned such a list and then a second list is given in which the stimulus terms are the same as in the first list but the response terms are different. For example, in the second list he must learn to say LAP when COW is presented and CUP when RUG is presented. The associations between the two lists are in conflict, but the interest here is in the memories for the two lists following, say, a twenty-four hours retention interval. As a control, another group of Ss. will learn a single list with retention measured after twenty-four hours also. If the recall of the first list is compared with that of the control list, a large difference will be observed: the recall of the control list will be far superior. This difference defines a phenomenon called *retroactive inhibition*. If the recall of the second list is compared with that of the control list, the control recall will again be found to be superior and this difference is called *proactive inhibition*.

The implication of these experimental findings is that the memory for a given event may be depressed by other memories estab-

lished after the acquisition of the target memory, and by memories established before the acquisition of the target memory. The illustration given above in which S. learned two successive lists with the same stimulus terms is a rather severe case of associative interference. But ideas about sources of interference should not be limited to such cases. Whenever there is conflicting information of any kind in two or more memories, the potential for interference is present. Given this conflicting information, maximum memory loss from interference will occur when there is complete overlap of other information. This overlap prevents such information from serving as a means of distinguishing among the memories. For example, temporal information has been found to act as a powerful discriminative factor even when the potential for interference is present. When the learning of two conflicting lists of associations (as illustrated earlier) is separated by several days, proactive inhibition is much less than that observed when both lists are learned on the same day. The temporal information differed sufficiently for the two lists to act as a discriminative cue. The Ss. appeared to have one set of responses appropriate to the stimulus terms for one day, and a different set for a later day. In a manner of speaking, the temporal distinctiveness made the identical stimuli different.

In the procedures used to measure retroactive and proactive inhibition, the control list—the single list—was also forgotten, but the magnitude was less than for the two conditions where two lists had been learned. This returns the discussion to the earlier question: What is responsible for the forgetting of this control list? One theory holds that it is also produced by retroactive and proactive interference from memories established prior to S.'s arrival at the laboratory and from memories established during the retention interval. This extrapolation seems reasonable, but it has been difficult to obtain evidence to account for all of the forgetting. The approach has been to use tasks which are

assumed to differ in the degree to which they conflict with information contained in previously established memories. The greater the conflict, it is assumed, the greater the loss to be expected from proactive interference. No large differences in retention have been produced by such procedures. This could be interpreted to mean that the interference theory is not capable of accounting for *all* forgetting. However, it is possible that when the degree of conflict between associations is increased, other information becoming a part of the memories also changes, and in some way this information may compensate for the increased forgetting expected from the increased interference. Nevertheless, the possibility remains that there are factors other than interference, such as organic decay, which account for some forgetting.

3. *Measures of memory.* Most studies of retroactive and proactive inhibition have used recall measures of memory: S. must produce responses to stimulus terms. In severe cases of interference, it is sometimes found that S. cannot recall a single correct response. Yet if, following recall, re-learning trials are given, it is found that S. can re-learn in far fewer trials than required to master the task originally. Hence, the re-learning measure detected the fact that some components of the memory remained, whereas the recall measure did not.

Another measure of memory is recognition, a measure resulting when S. is asked to identify the correct word or correct pair from among several words or pairs. Retroactive and proactive inhibition is usually found to be much less when recognition tests (as opposed to recall tests) are employed. This indicates that the central effect of interference is an inability to produce appropriate responses. The difference in recognition and recall measures has greater theoretical importance than that implied above. A growing body of evidence suggests that decisions by S. on a recognition test may be based upon information that only partially overlaps that determining recall. This again stresses the

conception that a memory may contain a variety of types of information.

In a typical recognition task, S. is presented with a long list of words, one at a time, for brief study. Then, these words are mixed with new words and S. is asked to check only the old ones (the ones shown for study). Under such procedures, S. will check 80–90% of the old ones, and very few of the new ones. How are these discriminations made? One hypothesis with considerable support holds that the discriminations are based primarily upon a frequency difference. The old items have a frequency of one in this particular situation, the new items a frequency of zero. If S. can discriminate this frequency difference, he will be correct if he chooses the words with greatest frequency. If the situation is changed slightly it can be shown that S. can discriminate this frequency difference with considerable accuracy. After presenting the long list of words for study, each is paired with a new word and S. is asked to choose the word in each pair having the highest frequency. He will be correct on about 80% of the pairs. Frequency information appears to be a part of all memories; its presence is implied whenever statements are made about differences in familiarity. It can be seen, however, that frequency information can only serve to discriminate among memories; it could not be used to produce responses as required in the recall of a paired-associate list. Other information, usually associative information, must mediate recall.

4. *Short-term memory.* In recent years, many investigators have employed short-term memory tasks as vehicles for understanding memory. In the simplest case, S. is shown a *single* item (a nonsense syllable, perhaps) for brief study. Then, an unrelated task is given to prevent rehearsal of the syllable. Finally, after perhaps thirty seconds, S. is asked to recall the syllable. If several successive syllables are given by such procedures, it is found that rather severe forgetting of the most recently presented syllable will occur over the thirty seconds. The forgetting

is most readily interpreted as a case of proactive inhibition. The previously presented syllables interfere with recall of the syllable of the moment. A number of memory phenomena can be studied by this and similar techniques; in a sense, this short-term memory situation is a microcosm of the list-type situation on which most of the foregoing discussion has been based.

One of the most ingenious uses of the short-term technique is to study the types of information which form a memory. It is assumed that the increasing proactive inhibition which occurs as successive items are presented is due to conflicting or non-discriminative information contained in the successive memories. If, then, at some point in the series, an item is given which does not contain conflicting information, proactive inhibition should sharply decrease. From such procedures it has been discovered that the memory for a common word may be based on associative information, conceptual information, affective information, and so on. These studies affirm previous conclusions; a memory is a complex set of information.

5. *Models of memory.* Much of the above discussion has been concerned with interference among memories. In recent years theorists have been producing models of memory which are at a level of theorizing quite different to that implied by interference theory. These models all have two features in common; that is, they postulate two different memory systems. One of these is a short-term system in which incoming information may be held for a very short period of time (fifteen to thirty seconds). If further processing of the information does not occur (as by rehearsal), it will be lost. Roughly, the short-term system may be said to be operating when we look up a telephone number, get a busy signal, and then, a few seconds later when we wish to dial again, find that we have forgotten the number. The second system is the long-term system, or the relatively permanent memory. Details of these theories provide mechanisms for interchange between

the two systems, for search mechanisms, for the selection of incoming information, and for systematic storage in the long-term system of related memories. Also, of course, they must provide mechanisms to handle the interference among memories. Because these models represent a relatively new way of conceptualizing memory, their long-term impact on research has yet to be realized.

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B. J. Underwood

II. Memory is the ability of an organism to store information from earlier learning processes (experience; retention) and reproduce that information in answer to specific stimuli. The information is reproduced in the form of conscious representation, verbal statements or motor activity.

Afterimages (eidetic imagery), illusions, hallucinations, fatigue phenomena and experiences of boredom and saturation are not generally classed as memory phenomena. A distinction must also be made between memory and fantasy (q.v.), perseveration (q.v.), and thought (q.v.). While classical memory psychology considers memory as a conscious phenomenon (H. Ebbinghaus, G. E. Müller, A. Pilzecker, E. Neumann) and ultimately as radical associations, this theory is refuted by the biological approach (E.

Hering, R. Semon, E. Mach) which attributes memory capacity solely to "organized matter" (E. Hering); the behaviorists (R. S. Woodworth) largely disregard the criterion of consciousness.

Ebbinghaus (1885), G. E. Müller and their co-workers and pupils must be considered as the founders of experimental memory psychology. Their work was continued and revised by Bartlett (1932), who also put forward new theories.

The classical distinction between perceptual ability (direct, short-term perception) and memory in the true sense of the word (long-term retention) has now given way to the distinction (which has been confirmed by a wide range of experiments) between *short-term* and *long-term* memory. Memory psychology is concerned with research into the different phases of memory: impression, retention/forgetting, reproduction (see *Memory I*), the phenomena of short- and long-term memory and, more recently, research into the neurophysiological processes within these phases.

1. *Retention*. The phase of retention, in which the actual memory function takes place, is considered formally from the complementary aspects of retention and forgetting but is viewed psychologically as a single unit. Memory in the sense of a storage unit has only a limited capacity: not all the information received previously is available in complete and unmodified form at any given time. Individual information is selected (memory as a selector) or changed (memory as a modifying agent). The retention capacity is dependent on the following factors: (a) on conditions of acquisition of memory content, such as the scope of the learning material (Ebbinghaus law), learning time or number of repetitions, distribution of learning (massed or distributed learning), age of the memory content (Jost's theorems), unforeseen interruption of the learning process (Zeigarnik effect), etc.; (b) on the nature of the learning material: formal aspects such as position in the learning series, gestalt character, etc.;

content aspects such as meaning retention and differentiation, feeling tone, cognitive categorization (clustering), etc.; (c) on physical and motivational factors of the subject: degree of fatigue and general physical condition, attitude (set) to the learning content (warming up), attentiveness, concentration, interest, performance motivation, degree of anxiety, overall mood, responsiveness, etc.; (d) on reminiscence: a distinction must be made between the Ward-Hovland phenomenon and the Ballard-Williams phenomenon.

2. *Forgetting*. Forgetting must be considered as the non-availability or modification of memory content (stored information). It is a function not only of time but of the mental processes occurring over a given time. A general distinction must be made between "mechanical" processes in which the memory trace is considered hypothetically as a "passive" physiological correlate of the mental activity (Gomulicki, 1953) and "dynamic" processes in which the memory trace is considered as an "active" process which alters during the retention interval (qualitative change). The following four individual aspects must be considered: (a) absence of processes (repetitions) which maintain or facilitate retention (D. E. Broadbent) (forgetting curve); (b) extinction: by contrast with (a) a habit is "forgotten" in the time during which it is performed (without reinforcing stimulus); (c) interference (see *Memory I*); memory inhibitions: superimposed information is mutually inhibiting. Forgetting appears here as a process of re-learning and is directly dependent on the extent of a previous or subsequent information acquisition; (d) modification: emotional and motivational attitude factors determine to some extent what is retained and for how long. During the retention phase, memory content undergoes some deformation (modification). The gestalt psychologists consider that this is due to an "autonomous process" based on gestalt laws (*leveling* and *precision* = *pregnance*). Bartlett believes that the modification is due to creative reconstruction on the

principles of rationalization and conventionalization (avoidance of contradictions, attribution of subsequent meaning) and is clearly influenced by emotional factors, e.g. wishes and fears (rumor). Katona (1940) attempted to reconcile the two theories. According to Sintschenko (1969) forgetting is determined not only by the special nature of the material involved but, especially, by the way in which that material is considered. From the angle of depth psychology (q.v.), forgetting serves to maintain a constant psycho-dynamic equilibrium by displacing unpleasant, "tabooed" memory contents with a strong affective significance.

3. *Short-term, long-term memory.* The latest studies based on factor analysis, cybernetics, learning psychology and neuropsychology show that there is no uniform memory capacity (general memory) but a number of different memory dimensions, e.g. for specific types of material, sense modalities and storage intervals (Guilford, 1959; Katzenberger, 1967). The short-term memory—lasting at most some thirty seconds—is interpreted as a bioelectric process in the form of a closed neuronal circuit and is strongly susceptible to forgetting (filter effect; Broadbent, 1958) and interfering influences (labile phase). The long-term memory is more resistant to forgetting and faults (stable phase) and is used for the long-term storage of information in the form of biochemical patterns. These observations suggest an intermediate phase of consolidation and reinforcement at the end of the labile phase for information which is still present. Information losses occur on transfer through the different storage centers.

4. *Neurophysiological aspects.* Physiologically, the memory is primarily associated with the ganglionic cells of the grey cerebral cortex (neo-cortex) and the white fibers of the cerebrum located below it. Molecular biological and biochemical research has shown that protein synthesis, peptides, lipides and changes in ribonucleic acids (RNA) with specific base sequences play a significant

role in long-term storage. Clearly, memory contents are stored in the form of a (chemical) consolidation process by alternating association of protein molecules to form different molecular chain lengths. No clear explanation is available but the old theory of "engrams" seems to be confirmed in the form of biochemical patterns with a relatively resistant structure. Forgetting, on the other hand, seems to be due to biochemical neutralization of RNS by RN-ases. The biochemical process of calling on available information (decoding) is completely unexplained as yet. Further results suggest that different learning types can be assigned different storage loci in the brain (subcortical and cortical) (Richter, 1966; John, 1967).

5. *Memory theories.* In the present state of research, memory theories are bound to remain purely speculative. A number of psychological, physiological, biochemical, cybernetic and physical models have been proposed to explain the phenomenon of "memory" but they remain unsatisfactory so long as they fail to take into account any motivational aspects of memory in the living organism (memory as a connection between sensory and motivational information circuits; Richter, 1966). The classical explanation of memory phenomena assumes as a working hypothesis that learning processes leave traces (engrams) which are renewed by repetition and form the physiological correlate for reproduction of information. The traces are considered either as changes in the ganglionic cells of the cerebrum or as being "purely psychological". The reproduction of memory contents is explained primarily by the hypothetical construct of associations; other decisive factors are logical relations and meaning associations within the memory contents and the motivational and emotional state of the organism (associative, mechanical and logical "meaning" memory). Hebb (1949) proposed a self-contained model based on forms of short- and long-term storage in neurophysiological terms. Proposed models for learning and retention in the sense

of a coding process (Müller, 1956; Ausubel, 1963) and notions of reproduction as decoding, in particular in conjunction with modern knowledge of the structure and function of the nervous system (Oldfield, 1954; Broadbent, 1958; Brown, 1958, 1964), are also important.

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F.-C. Schubert

Memory afterimage. See *Afterimage*; *Memory*.

Memory disorders are due primarily to central (sometimes reversible) ganglionic failures caused by injury, bleeding, intoxication, pathological processes or decomposition phenomena (cerebral arteriosclerosis). Depending on the anatomico-pathological location of the disorder (and hence of the neurophysiological correlates responsible for specific memory dimensions or involved in the processes of storage or reproduction), different disorders or combinations of dis-

orders occur. In general, a distinction must be made between qualitative (biographical; Korsakov syndrome) and quantitative (amnesia) impairment, as well as between (relatively minor) disturbance of the short-term memory, and disturbance of the long-term memory (caused by more massive processes).

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Memory image. See *Mental imagery*; *Fechner*.

Memory, immediate. See *Memory*.

Memory, inhibitions of. The classical work of the German association psychologists showed that the difficulty of retaining or remembering taught matter may be related to events which took place before or after the learning process. Reference is made in particular (although not exclusively) to interference phenomena between two successive learning processes.

Rohracher (1963) distinguishes between the following possible forms of interference: (a) retroactive or reactive inhibition: if further learning processes follow the learning of a series of contents the retention of the first series is thereby impaired. (b) Proactive inhibition: a directly preceding learning process impairs retention of subsequent contents. (c) Similarity, or Ranschburg's inhibition: the interference between two learning processes is particularly strong if there is a similarity of the matter taught. (d) Associative or reproductive inhibition: contents which were already associated in previous learning are more difficult to link with new contents than those in which this is not the case. (e) Ecphoric inhibition: if new material is taught shortly before the reproduction of material learnt earlier, there is a negative influence on the reproduction of material learnt earlier. (f) Affective inhibition: the occurrence of strong affective stimuli between the exposure to and reproduction

of a content impairs reproduction of that content.

Recent work by American memory psychologists has concentrated on studies of retroactive and proactive inhibition in close relationship with problems of transfer.

L. Blöschl

Memory span. Generally defined as the period of time within which perceptions that are not connected with any learning intention can still be correctly reproduced (current memory). The reproduction time still comes within the range of "psychological presence" (W. Stern) and the typical reproduction consciousness is often lacking. In particular the memory serves to measure short-term perceptual ability (short-term memory) defined as a "memory-span method." The memory-span performance is the number of correctly reproduced elements directly after successive presentation on one single occasion of the unconnected learning elements. In adults the performance is six to ten (generally about seven) elements and is dependent on the nature of the elements (degree of acquaintance, complexity) and the overall duration of presentation. Performance in the "static" memory span (known length of learning series) was found by Pollack *et al.* (1959) to be better than in the case of a "running" memory span (unknown series length).

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F.-C.S.

Memory trace field. All the traces which have a dynamic connection (see *Engram*). Gestalt psychology considers that every trace can influence the others and is in turn dependent on them. In addition, a dynamic interrelation is postulated between the memory trace field and the phenomenal field.

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P.T.

Menace. Inhibited aggression (q.v.) accompanying an activated desire for flight or sex. Usually found with enlargement of the body surface, erection of hair, feathers and fins, baring of teeth and claws. Often certain body postures have a menacing effect as, e.g. the lowering of the head with gulls and fish. Menacing sounds occur with vertebrates and insects. Syn. *Threat posture*.

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Menarche. A girl's first menstruation. Occurrence is dependent on race, constitution, climate and pattern of life; in Western civilizations the menarche occurs on average in the thirteenth year. A century ago, the average occurrence in Western countries was at the age of sixteen to seventeen. Bleeding is still irregular to begin with, and ovulation rarely takes place.

H.M.

Mendacity. A tendency consciously to conceal or falsify facts with the intention of gaining an advantage for oneself or others, or in order to avoid unpleasant consequences, or to bring these about for others. It is not a general characteristic. Its detection is a central problem in forensic psychology (q.v.) (see *Credibility; Children as witnesses*), and attempts to confirm it must depend on the particular situation and individual motivation.

M.A.

Mendelism. Mendelian laws (G. Mendel) determine the inheritance of individual characteristics in successive generations: (a) principle of uniformity or reciprocity: if two different pure races are crossed (P1) the result is uniform. Male and female sex cells are equally important in inheritance. The development of features may be intermediate or dominant-recessive; (b) law of division: a cross between individuals of the first hybrid

generation (F1) results in different individuals (F2). The hereditary features are divided in a specific ratio: 1:2:1 in the case of intermediate feature development and 3:1 in the case of dominant feature development in the F1 generation; (c) principle of independence (principle of recombination of the genes of different gene pairs): when races which differ in more than one feature are crossed, the alleles (q.v.) of different characteristic pairs are inherited and combined independently.

I.D.

Meningitis. Inflammation of the meninges. May occur as *m. cereбрalis* (brain), *m. spinalis* (spine) and *m. cerebro-spinalis*. Its symptoms are high temperature, headaches, disturbed consciousness, stiff neck, contraction and tightening of the stomach muscles, hyperesthesia of the skin, visual disorders, and fluid changes. It may be caused by various excitatory agents such as meningococci, tuberculous bacteria, pyogenic bacteria from the sinus or ear, syphilitic agents, viruses (e.g. Coxsackie virus) or carcinomal growths. A complete cure is possible under proper treatment, but the central nervous system is often permanently impaired.

E.D.

Menopause. The cessation of menstruation due to the end of ovulation; the menopause marks the end of the sexually mature phase in the woman but not the end of sexual activity. It generally occurs between ages forty-five and fifty, beginning with irregular menstrual bleeding (= climacteric). The period before and after the menopause is marked by psychosomatic strains due to physiological, organic changes, also dependent in large measure on psychological factors. Symptoms of the menopause syndrome: sudden hot flushes, irregular and rapid heart beat, disturbed sleep, anxiety, depression, irritability and nervousness. See *Aged, sexuality in the*.

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H.M.

Menorrh(o)ea. 1. Normal menstruation. 2. *Menorrhagia*: Abnormally profuse or prolonged menstruation.

Amenorrh(o)ea (q.v.): Abnormal absence or cessation of menstruation, either as a result of organic disease or emotional disturbance. *Primary amenorrhea* is the failure for menstruation to appear at all; in *secondary amenorrhea*, menstruation appears at puberty but subsequently ceases. *Hypermenorrhea*: *Menorrhagia*: Excessive menstruation. *Hypomenorrhea*: Abnormally slight or abbreviated menstruation. *Oligomenorrhea*: Abnormal prolongation of the menstrual cycle. G.D.W.

Menstruation (Syn. *Period*; *Catamenial discharge*). The cyclic discharge of blood and sloughed-off uterine membrane that occurs at approximately four-week intervals in the sexually mature (post-puberal), non-pregnant female.

Menses is often used to refer to menstruation or the *menstrual cycle* in general, but, strictly, refers to the discharged material itself. See *Menorrh(o)ea*; *Premenstrual syndrome*.

G.D.W.

Mental abilities. See *Abilities*.

Mental age (abb. MA; syn. *Intelligence age*). The level of mental development expressed in terms of the chronological (life) age considered normal (i.e. that of the average child or adult for that level in a specific intelligence test). See *Abilities*; *Intelligence quotient*.

Mental defect. I. Mental defect (retardation or subnormality) is defined as "incomplete or insufficient general development of the mental capacities". It refers to an (arbitrary) bottom two per cent of the population: with IQ 70 and below on a test with a mean of 100 and SD (= standard deviation) 15. This IQ range is divided into profound: 0-19; severe:

20–34; moderate: 35–49; mild: 50–70, with borderline defect above 70. Three-quarters of the group lie above IQ 50, and one quarter below.

Nineteenth-century pioneers, such as Itard, Séguin and Montessori, elaborated training methods in mental deficiency, and in 1905 the study of individual differences was stimulated by Binet's development of intelligence tests (q.v.), originally designed to distinguish between educational backwardness and intellectual impairment. From Burt's appointment in 1913 as the first educational psychologist in the world, a stream of important surveys began to emerge. The multi-disciplinary study of mental deficiency has accelerated since World War II. One or more of the following general causes, separately or in interaction, are responsible for the individual case: (1) *genetic* (either normal variation in the IQ range 50–70 or resulting from an abnormal genetic factor, usually but not invariably in the IQ range 0–50); (2) *social* (subcultural) interacting with normal variation; (3) *disease or injury*, pre-, peri, or post-natal.

Research relates to description, prevention and amelioration. Recent studies of prevalence suggest a decrease in incidence of moderate, severe and profound cases largely masked by increased survival rates, particularly of mongols. It is more difficult to estimate numbers of mild cases, since these merge into normality, with the majority receiving minimal help after school age. Reducing incidence for the whole group depends on multiple factors: decline in childhood diseases, use of immunization techniques; improved social conditions, earlier completion of families, genetic counseling, decline of malnutrition, early diagnosis and treatment of rare metabolic disease, as well as specifically designed programs of education and training. Psychological contributions lie in the fields of (a) fact-finding surveys, (e.g. on community services and family problems); (b) assessment of individual abilities and disabilities; leading to (c) specific remediation (as well as general training)

techniques; (d) early stimulation programs, seeking to prevent the development of backwardness or mild defect; (e) experimental studies of psychological processes. A majority of these use normal MA- or CA- matched controls and attempt to cast light on the question of whether defectives are qualitatively as well as quantitatively different from normals.

It seems clear that two different populations (in terms of etiology, status and prognosis) above and below about IQ 50, respectively, are to be found within the whole group; findings in the higher group may not apply to the lower. Even among the severely defective, there is a degree of responsiveness to training, and with cases of profound handicap operant conditioning has been used successfully. Many moderately retarded adults respond well to industrial and social training. Mild deficiency can often be ameliorated by special educational techniques, and among those where social factors are aetiologically relevant, there may be a reversion towards normality, either through the effects of prolonged learning or delayed maturation. The USA. is currently basing its pre-school "Headstart Programmes" for deprived and potentially backward or mildly defective children on psychological research, but such attempts appear to be of too short duration, may use inappropriate methods, and lack subsequent reinforcement (see *Abilities*).

Experiment studies show: that EEG tracings correlate with intelligence, as does reaction time; that discrimination learning is mediated in a two-stage process by attention; and that, in short-term memory, defectives are always inferior to CA-matched normals and may also be to MA-matched controls. Hence acquisition is impaired, whereas retention of well learned material (long-term recall) is often good. Defectives show greater inter- and intra-individual variability than normals, and personality factors are also important. Although defectives are particularly handicapped in verbal and conceptual abilities, even among the lower grades,

passive conceptual processes can be demonstrated although there is a deficiency in verbal formulation. See *Abnormal psychology*.

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A. D. B. Clarke

II. In continental European educational theory, all children who do not have the necessary mental equipment to acquire an independent education and who cannot be helped in schools for handicapped children are described as "mentally defective". Unlike mental *retardation*, which only affects individual intellectual functions, mentally defective persons suffer from serious damage to all their abilities.

1. *Causes.* A distinction is made between a number of different causes of mental defects: there are exogenous causes due to brain disorders of all kinds (e.g. infections, birth or early-childhood trauma) and endogenous or genetic causes, the commonest being chromosomal anomaly: mongoloid idiocy is the commonest form, followed by the Klinefelter syndrome. Less frequently we encounter forms of mental defect in which the cause is a specific genetic block due to a major enzyme defect. In the forms of mental deficiency referred to so far, the brain is either unable for primary reasons to function normally or else is damaged secondarily by an external influence (trauma, infection) or organic cause (phenylalanine in phenylketonuria, q.v.).

In the case of many mentally defective individuals, no cause of this kind can be determined; there are no typical symptoms of a metabolic defect or chromosomal anomaly, nor any indication of exogenous damage. The following subdivisions are possible: (a) crude interventions may drastically reduce the ability of the brain to func-

tion, and therefore seriously impair the mental capacity of the individuals concerned. (b) These interventions may be exogenous (infection, trauma, etc.) but are often endogenous or genetic in origin. There is a further distinction between chromosomal anomalies and inborn metabolic errors. (c) In the majority of mentally deficient persons these crude interventions are not present. However, studies of family members and twins show the role of hereditary factors, and there are often degenerative symptoms.

2. *Behavior and social problems.* There is usually a general impairment of the mental functions in mental defectives: retardation of mental activity with infantile characteristics, apathy or erethism. Attentiveness may be limited by a tendency (of widely varying importance) to distraction, and in some cases all that remains is mere reflex attention. Frequently, perception in mental defectives is disturbed, without observable defects of the sense organs, e.g. because color impressions dominate the ability to perceive forms. Very often, there is retarded speech and speech deficiency until well beyond the normal school age, or even throughout life, e.g. stammering and paragrammatism.

Many social problems arise from the behavior characteristics and other features associated with mental deficiency. Within the family the mother is overstrained and fatigued by having to keep a constant watch on her child and there may also be financial problems. Stress situations with members of the family and the environment may arise because of destructive or aggressive behavior by the mentally deficient child, disputes between parents (accusations of guilt), or brothers and sisters (rejection, jealousy), or because of exclusion from schooling. Problems also arise for the parents in ensuring the welfare of the defective child, because they fear or see that he is mocked and harmed by others and are concerned for his future.

3. *Therapeutic possibilities.* Possibilities of medical therapy depend on the cause of the mental deficiency (e.g. dietary measures in

cases of phenylketonuria), or on its symptoms (sedatives in cases of erethism); this treatment never attacks the defect itself, but may have a favorable influence on it. Remedial education for children is vitally important. The major condition for successful education is good emotional care, which may even be successful to some extent in the case of children suffering from idiocy. Help from parents should concentrate on reducing the child's need for special care and making him more independent (keeping himself clean, eating on his own, etc.); the ultimate aim is to make the child capable of living in a community.

Motor functions and mental abilities may be trained by play (e.g. constructive games), drawing, painting and practice of all kinds. In the event of special retardation in speech, games to assist language development, and logopedic practice will be necessary.

As soon as the child reaches a level of mental development which enables it to receive outside education, or be separated for an extended period from its mother, it should be enrolled in a special school, or special nursery school, in order to enable it to join in a larger community and develop its mental capabilities. The progress made by the child, as well as the extent and quality of its ability to learn, will determine the possibility and time of its entry into a special school. If there is at least some ability to learn practical skills, simple craft activities can be acquired, enabling the child to pursue a meaningful occupation in the mental home, or even earn its own living (protective workshops). See also *Deficiency, mental* (= "mild" mental defect, but see *Mental defect*, I).

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M. Sachs

preserve but to improve psychological health are requisite. This includes helping the patient to overcome psychic disorders, and to achieve the best possible adaptation to his environment and harmonious relationships within his group.

The mental hygiene now practiced began with the attempt, as far as possible, to re-integrate cured or improved mentally sick people into normal life. In particular it originated at the start of this century in C. W. Beers's *A Mind that Found Itself*, which was a self-description. His book had a profound effect, particularly upon William James (q.v.) (1842–1910), who himself underwent a development crisis after studying science (physiology and medicine). As Professor of psychology and philosophy at Harvard from 1876 till 1907, his pragmatism had a decisive influence on the psychologists of his time. Beers also affected Meyer, the leading psychiatrist of the age. James and Meyer founded mental hygiene in the USA. Its purpose was to care for the mentally and emotionally sick, to improve the treatment and care of emotionally sick epileptics, and the feeble-minded, and to clarify the part played by psychological and mental disturbance in child-rearing, work, business and criminology.

H. Meng brought to his ideas on the care of mental health through human relationships the important findings of Freud's psychoanalysis (q.v.), and his own experience of somatopsychic symptoms. He succeeded in describing a pattern of symptoms which can cause serious disturbances of organic function (digestion, circulation, sexual organs), for which doctors trained in organic medicine alone could find no cause. Meng combined the study of these disorders and their cure under the term "organic psychoses" (q.v.). Research into mental hygiene has taught us the peculiarities of this "organic language" in its different forms and thus given us a better understanding of its psychic significance (see *Psychosomatics*).

Mental hygiene gained ground in the international sphere through the work of

Mental hygiene (syn. *Psychohygiene*). According to Meng's (1939) definition, mental hygiene is the *care of mental health*. Appropriate knowledge and the ability not only to

J. R. Rees. The third International Congress on Mental Hygiene in 1948 was attended by four thousand participants from twenty-seven countries. The World Federation for Mental Health was founded, which comprised at the time eleven international organizations and one hundred and forty-six societies in fifty-three different countries.

Mental hygiene has now evolved into a "multi-disciplinary" science. In addition to psychiatry proper, the special branch of *social psychiatry* has grown under the influence of mental hygiene. Building on the foundations of Freud and Meng, the child specialist E. Schomburg defines psychological health as a relative freedom from fear, threat and feelings of hatred, so that a positive attitude to one's personality (q.v.) and ego (q.v.) and to other people and the human condition can be achieved.

The aims of mental hygiene may be delineated thus:

(1) The development of the power of self-discovery, in experience of the self and self-knowledge;

(2) the development of the struggle for a true self-affirmation;

(3) the capacity to give other people the same value as one claims for oneself;

(4) the unhampered development of a power to love, which wishes not only to possess the loved one, but to mean something to, and to enrich him or her;

(5) unhampered performance of normal functions;

(6) the development of the power to make appropriate, unprejudiced judgments.

All these aims of mental hygiene can be realized only through the cooperation of several, varied disciplines. In medicine, mental hygiene grew out of psychiatry. It not only includes the different disciplines of hygiene, as well as social hygiene and social medicine, but specialist fields of internal medicine, gynecology, pediatrics (q.v.), and even dentistry. This is particularly the case in the development of *psychosomatic medicine*. Strictly speaking, this is not a specific branch

of medicine, but a particular way of looking at bodily and mental interaction in the most varied illnesses. It was practiced at first in America by Alexander (1950), and then principally by Weizsäcker (1947) in Germany. It confirmed the theses of H. Meng on organic psychoses and stressed the importance of problems and crises in the patient's life for the development of organic disorders (see *Psychosomatics*). Mental hygiene was then strongly influenced by the study of child development and law, and in turn influenced them. This was particularly true in the case of juvenile courts (q.v.), and of the borstals of Austria (Aichhorn, 1957), and the USSR (Makarenko). There has also been a fruitful cooperation between mental hygiene and psychology. Mental hygiene has come a long way from the original psychiatric after-care, and the concern with eugenics. It is associated more and more closely with psychology in social work. This is shown best by the development of a particular branch of mental hygiene in group work and group therapy (q.v.), which are themselves closely related to sociology. Group therapy was developed in Vienna in about 1912 from the mutual aid groups of prostitutes, by Moreno (1946; 1956). The first results of this psychological and educational orientation became apparent in the USA with the arrival of emigrants from European countries threatened by Hitler. At the beginning of World War II Moreno could demonstrate the significance of friendly relations within groups or between partners by the selection of aeroplane crews (see *Psychodrama*). He achieved a notable decrease in accidents compared with crews who had nothing but their technical training. In the last twenty years, group work and group therapy have made an enormous difference to the atmosphere of the most varied societies, and have adopted the aims of mental hygiene. This is true in the first place of numerous mental hospitals, where patients increasingly live as therapeutic communities. But it is also apparent in the treatment of many other

social situations, from the intimate to the criminal. Mental hygiene still has much work to do. (See *Psychopathology; Gerontology*.) Many disciplines, not least psychology and social psychology, combine to bring us nearer to fulfillment of mental hygiene's demands.

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A. Friedemann

Mental imagery. In one sense of "imagination", an idea may be viewed as a "mental image" or "memory copy" which, in the absence of the corresponding sensory stimuli, represents to the conscious mind previously perceived objects or processes. A *mental image* may be defined as the subjective combination of fragments of earlier perceptions. A genuinely imaginative idea would require an awareness that that which is ideated or imagined is non-existent in the external world of reality. In contradistinction to impressions

derived directly from sense perceptions, the contents of mental images are usually imprecise, less detailed, and without clear localization in space. They do not possess the persistence and continuity of experiential perceptions. According to the sense modality, there are visual (optical), acoustic (auditory), kinesthetic (motor), tactile, olfactory and gustatory ideas or images (*concrete images*). When several sensory modalities combine to produce the image, it is known as a *composite image* (or *idea*). (See *Fantasy*.)

Mental imagery in the above sense must not be confused with the pseudo-perceptual, realistic character of compulsive hallucinations (see *Hallucination*). It is questionable whether, as some argue, "eidetic" phenomena are qualitatively different from intensive visual images.

Theories regarding ideas and mental imagery have played a considerable part in the history of psychology and philosophy (e.g. Locke, Hume, Leibniz, Herbart). In some older systems, any more or less "perceptible" mental content was characterized as an idea or image. Later on, there were frequent attempts to ground all intellectual life in mental imagery, and to view the laws of association and the regularities of mental images as the essential categorical principles of the intellect. Galton (q.v.) was the first to carry out anything approaching an empirical investigation of the modes and functions of mental imagery. (See *Idea*.)

In regard to the inter-individual differences in mental imagery, J. M. Charcot inspired a number of attempts to describe so-called "ideational" or "imaginative" types (the visual type or visualizer, the acoustic or auditory type, and the motor type, etc.). In order more exactly to determine the individual dominant type of ideation, several quite objective methods were developed (association analysis, appropriate distractors in selective answer tests, questionnaires, picture description, stylistic analysis, etc.; cf. Woodworth & Schlosberg, 1965). Nevertheless, the validity of these methods has often

been questioned. According to Betts (1909), distinctions between ideational or imaginative types are not justified, since there would seem to be high correlations between imaginative capacities in different areas.

For a long time, preferred research topics were the laws of ideation (of image reproduction) and the significance of mental images in thought (problem-solving) processes and concept (q.v.) formation (see *Language; Thinking*). In order to explain mental imagery, association psychologists (e.g. G. E. Müller) referred mainly to the so-called laws of coexistence, succession and similarity, and perseveration (see *Association*). In order to explain arbitrary ideation and the solving of specific tasks on this basis, recourse was had, e.g. to the notion of the initial, goal or objective idea or image in connection with the theory of image complexes. On the other hand, the Würzburg school (q.v.) allowed mental imagery only a subordinate (if any) significance in thought processes proper ("imageless" or "abstract" thinking). For the Würzburg school, mental images were merely "illustrations" of the thought process. Their particular clarity or concreteness decided how far they helped or inhibited thinking. The formation or understanding of a concept can be accompanied by "mental images"; however, the concept is not identical with any specific image. Supporters of the so-called motor theory of thinking and consciousness point out that mental images (e.g. motor and visual images) are accompanied by changes in the corresponding muscular area, e.g. the arm and eye region (Jacobson, 1932; Max, 1935). With full relaxation of the specific muscles, the image should disappear, or the intellectual activity accompanying it should become impossible. Nevertheless, this cannot be safely postulated as the basis for a causal connection between muscular and ideational activity.

In the psychoanalytic view (see *Psychoanalysis*), certain images act as representations of, and safety valves for, pent-up instinctive energies, when—on account of the non-

availability of the object of the drive in question, the direct release of energy by way of the instinctive action is impossible. The motivational significance of imaginative ideas results in part from their possible precursory nature. The contents of mental images, even without consciously willed intention, can arouse the impulse to carry out what is proposed in ideal or imaginary form.

Under the influence of certain toxic agents, such as mescaline (q.v.), an unusual intensification of mental imagery is noticeable. But unusual visual, acoustic and kinesthetic images can also be evoked under extreme perceptual conditions, i.e. by the drastic reduction, homogenization, monotonization and diminution of the significance of percepts (sensory deprivation; cf. Solomon *et al.*, 1961). The characterization of these phenomena as "hallucinations" may be countered by the fact that most testees do not ascribe reality to mental images, despite their emphatic character, and therefore do not derive them from specific environmental stimuli.

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F. Süllwold

Mental imagery therapy. Since Freud (q.v.) made the interpretation of dreams the royal road of his psychoanalytical healing method, numerous other methods of therapy with mental imagery (q.v.) have been developed.

The "*rêve éveillé dirigé*" (R. Desoille) and the "catathymic image life" (H. Leuner) are independent of dreams and introduce an informative vertical direction into mental imagery therapy. In cases of severe neurosis hallucinogenic drugs are helpful in this "psycholytic therapy" (H. Leuner, B. Berta, etc.). "Hypnotic imagery" intensifies healing experiences with images; as "autogenic imagery" (K. Thomas) it can be taught in groups and also practiced at home. In 1968, representatives of about four hundred methods came together in Geneva to found the "International Society for the Psychotherapeutic Application of Image Experience". See *Archetype; Hypnosis*. K.T.

Mental maze. The term denotes the following arrangement: pairs of one word and one syllable are given. A testee then has to find a way through these pairs of words and syllables by deciding in each case which of the two alternatives to choose (word or syllable). One of the alternatives is considered to be correct. The exercise has been done correctly if all the decisions are "correct". Mental mazes are used in research into learning (q.v.).

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Mental sickness. A mentally sick individual is characterized by abnormal patterns of experience and behavior. Whereas the personality is basically intact in a neurotic person, it has broken up in the mentally sick individual (psychotic). The patient can no longer distinguish between external and internal experience, imagination and perception, and the relationship between the ego and social environment is disturbed. The main forms of mental sickness are schizophrenia, manic depression, paranoid conditions (endogenous psychoses), conditions brought about by brain injury, alcohol, drugs, syphilis, aging and other external influences (exogenous psychoses), and mental sickness

of a purely organic nature. Until recently persons suffering from such disorders were thought to be "possessed." The Spaniard, Father G. Jofre, was one of the first to call for them to be treated as sick persons. In 1409 he founded a "hospital dels folls" in Valencia, the first mental home in Spain and no doubt one of the first psychiatric establishments in Europe. See *Abnormal psychology; Psychopathy; Psychoses, functional*. E.U.

Mental training. Practice in thinking. A problem of transfer research: can sensorimotor skills be acquired by mental training alone? Early studies by R. S. Sackett (1934, 1935), H. M. Perry (1939), K. E. Baker and R. C. Wylie make a distinction between three different factors of mental training: verbalization, optical imagination, implicit motor reactions; main result: only intensive mental training has a transfer effect. H.W.

Menticide. See *Brainwashing; Manipulation*.

Meprobamate (*Equanil; Miltown*). The first of a new (the propanediol-carbamate) group of tranquilizers (q.v.) put into widespread use in 1954, meprobamate remained the only tranquilizer of clinical importance until the development of the benzodiazepines. Meprobamate is characterized by emotional and motor relaxing, anxiolytic action, without resulting fatigue, over a wide dosage range. Meprobamate has muscle-relaxing and anti-convulsive properties. There are no effects on the autonomic nervous system. The central effects concern primarily the thalamus and limbic structures; in relatively small doses, stimulation of the reticular formation has been observed, but when the dose is increased the opposite effect is obtained. The drug was studied in more than fifty experiments in healthy persons. Tranquilizing effects occur in doses of 200 to 800 mg, particularly in emotionally labile persons and under stress;

there is sometimes increased subjective activity and a tendency for performance to be heightened rather than impaired, in particular as regards motor and learning performance. Differences in intraindividual and interindividual effects seem less marked than in the case of the benzodiazepines and neuroleptics. Fatigue and reduced performance may occur if doses exceed 1200 mg. In combination with alcohol the effects seem merely to be additive (the opposite is the case with sedatives).

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G.D.

Merkel's law. The proposition of Merkel that equal differences in sensations above threshold correspond to equal stimulus differences. This is in conflict with the more widely accepted *Weber-Fechner law* (q.v.).

G.D.W.

Merkwelt. (Ger.; syn. *Eigenwelt*; Eng. *Perceptual world*). In Uexküll's environmental theory, the environment as perceived subjectively, specifically and effectively by a particular species or animal in terms of its own sensory capacities, and reacted to in terms of a specific "*Wirkwelt*", or behavioral repertoire. See *Animal psychology; Comparative psychology*.

K.Fi.

Mescaline. An alkaloid of the Mexican cactus "peyote", and a derivative of phenylethylamine, mescaline has been used for centuries as a narcotic and was an essential feature of the pre-Columbian religious practices of the Aztecs and other Mexican Indians. The earliest scientific reports on mescaline were descriptions of experiments conducted by individual doctors and psy-

chologists (e.g. Prentiss & Morgan, 1895; Beringer, 1927). In the nineteen-fifties mescaline was used to generate "model psychoses"; it was hoped to imitate a psychosis reversibly in the model, and neurochemical hypotheses concerning schizophrenia (q.v.) were prepared in this way. Mescaline has effects similar to those of other psychotomimetics but it has a comparatively prolonged effect (8 to 15 hours).

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H.K.

Mesencephalon. The midbrain, a part of the brainstem situated between the diencephalon and the pons. It consists of the *tectum mesencephali*, the *tegmentum* and the *crura cerebri*. Many nerve paths and nuclei are situated in extremely close proximity in a small area.

G.A.

Mesmer, Franz Anton. B. 23/5/1734 in Iznang (Lake Constance); d. 5/3/1815 in Meersburg. Founder of Mesmerism, the theory of *animal magnetism*. He studied theology and medicine and made a name for himself as a doctor by his *theory of the curative power of magnetic iron*. From 1776, Mesmer believed he had discovered that the magnetic therapy he had so far advocated did not depend on the effect of the magnet but on some mysterious power, some fluid, by which men possessed of a special gift (magnetizers) could effect cures. This is a case of a prescientific view of the power of suggestion (q.v.). Mesmerism had a far-reaching influence on Romantic medicine and philosophy, as well as on the early forms of hypnotic treatment, the nature of which was to be investigated first by the Scottish surgeon J. Braid; he then gave this method of treatment its definitive name—hypnosis (q.v.).

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Mesoderm. In addition to the ectoderm and entoderm, a third stage of embryonal development, i.e. the mesoderm, can be distinguished in the articulated animals and vertebrates. It is generally a derivative of the primary entoderm. It produces primarily the connective tissues and the tissues or organs derived from the latter (e.g. muscles, vertebrate skeleton). *H.Sch.*

Mesomorphy; mesomorphic type. One of the typical physical forms described by W. H. Sheldon in his typology. He believes that the different physical types result from the dominance of different primitive layers (entoderm, mesoderm, ectoderm) in the physical development of an individual. Mesomorphy is then explained by dominance of the mesoderm and is reflected in strong bone and muscle development. The phenomenon of mesomorphy corresponds largely to the athletic constitution type described by E. Kretschmer. *W.Se.*

Metalanguage. In formalization procedures, the language or languages which may be used to speak about a formal system or an objective language. It includes the names of terms and formulas of the system, and those of its classes; it is used to formulate their rules of construction and all the properties characteristic of the system. It is also possible to formalize a metalanguage by means of a meta-metalanguage; and so on. The metalanguages used in formal logic are finitistic arithmetic, set theory, and natural language. By derivation, any assertion which contains a judgment not on an object but a proposition is "metalinguistic". *M.J.B.*

Metamorphopsia. 1. A distorted view of objects, e.g. in the case of retinal detachment.

See *Astigmatism. 2.* Deviation of visual perception from reality owing to sensory illusion. *R.R.*

Metamphetamine. A central stimulant belonging to the amphetamine (q.v.) group.

Metapsychology. A branch of parapsychology which seeks transcendental causes for psychological behavior (S. Freud). *R.D.*

Metatropism. The "inversion" of emotions and feelings in sexual matters. The assumption of the specific sexual behavioral characteristics of the opposite sex causes a man to adopt a more passive role (see *Effemination*), while a woman on the other hand displays active tendencies and patterns of behavior (see *Virilism*). *K.E.P.*

Methadone. A psychotropic substance which belongs among the analgesics (q.v.). Methadone is pharmacologically similar to morphine but acts more slowly. Since 1965, methadone has been used to treat heroin addicts. It blocks the euphoria induced by heroin, and in small doses prevents withdrawal symptoms.

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Method of constants. A psychophysical method for determining thresholds. An object or stimulus invariable in some respect (the constant stimulus) is presented for comparison with a series of similar stimuli in random order. The percentage of correct judgments determines the threshold. This psychophysical method gives sufficient information for analysis in terms of models more complex

than the simple threshold model, such as those derived from *signal detection theory*.

C.D.F.

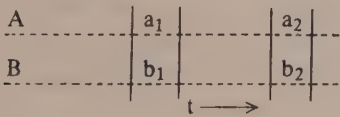
Method of least squares (syn. *Least-square method*). A method of curve fitting in which the curve parameters are determined in such a way that the sum of the squared deviations of the curve from observed values is a minimum. The method is used for optimal adaptation of theoretical distributions to empirical distributions, e.g. regression line.

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G.Mi.

Methods of psychology. The methods of psychology are used in a specific problem to make observations, compare them with one another and draw conclusions in order to answer the given problem. They are instruments of psychological research and diagnosis. They have been specially developed and harmonized to deal with specific problems.

1. *General.* Since psychology deals with a totality of processes, it is based on observations. Observation is the study of a process in which at least two points of the process are studied. The aim is to determine the specific consequences which occur under specific conditions. A single observation, however precise, would never be sufficient for this purpose. It can only become significant if it is comparable with at least one other observation made of a further, comparable process. The following diagram illustrates this point:



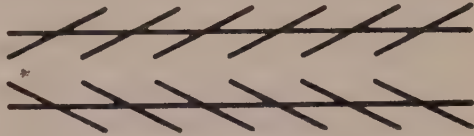
Let A and B be two processes which occur in the time t, while a₁ and a₂ are observed parts of process A, and b₁ and b₂ observed parts of process B.

The following examples from perception theory will help to illustrate this: Example for A. An individual observing a pattern as in

the figure below (a₁), asserts that the two horizontal lines are *parallel* (a₂).



Example for B. The same person observes another pattern, as in the following figure (b₁). On this occasion he asserts that the two lines are *divergent*.



The observer now compares A with B. On the basis of their direct relationship, a₁ and a₂ on the one hand, and b₁ and b₂ on the other, are now correlated: a₂ is dependent on a₁ and b₂ on b₁. Or: a₁ leads to a₂ and b₁ to b₂.

$$\begin{aligned} a_1 &\rightarrow a_2 \\ b_1 &\rightarrow b_2 \end{aligned}$$

It is clear that the difference between a₂ and b₂ is dependent on the difference between a₁ and b₁.

One of the two processes (e.g. A) requires no special study if the relevant relationship (here a₁ → a₂) is already known: one knows that, “normally”, parallel lines on a sheet of paper also look as if they were so. But, even then, a comparison is made—between a present observation and one in the past.

If an observed difference between a₂ and b₂ is in fact explained by the difference between a₁ and b₁, a₁ and b₁ must only differ in a *single*, precisely defined feature, i.e. in the feature which is the subject of the study. In all other features, a₁ and b₁ must be identical. Only variable conditions can be studied. A constant factor which always plays a part could not be detected. A feature therefore has at least two and generally more “degrees of intensity”, “classes” or “values”.

These can sometimes be determined quantitatively, i.e. by dimensional units, and sometimes only qualitatively, i.e. by terms regarding their characteristics. The variable features are known as *variables*. A distinction is made between stimulus or situation (S) variables and reaction (R) variables. S variables are, e.g. the qualitative classes of optical patterns, the length of a subject item to be learnt, or the dose of a stimulant. Examples for R variables are judgments such as "Yes" or "No", "parallel" or "divergent", "larger", "identical" or "smaller", "beautiful", "neutral" or "ugly"; the quantity of information learnt; the speed of forgetting and the reaction time. S variables should be understood as independent variables within the study concerned; R variables, on the other hand, are dependent variables. Remembering our diagram, it is possible to write:

$$S_a \rightarrow R_a$$

$$S_b \rightarrow R_b$$

S_a and S_b are defined categories for a single stimulus variable. This is only one part of a more complex stimulus situation which contains other variable components (e.g. illumination in a room, presence of other persons, etc.). The observed R variable only defines part of the total reaction which consists of more than, e.g. simply a judgment or reaction time.

Part of the process which is studied is situated between the stimulus and reaction, i.e. the inner, subjective process. It is known to the individual concerned but cannot be observed from outside. The judgment or other behavioral datum of a person (e.g. the reproduction of learnt information or a physical reaction) is simply a sign of a process which takes place within him. Nevertheless psychology is concerned with this inner process: our aim is to determine how a pattern is perceived, a subject learnt, a problem of thought solved or an action motivated. From observation of behavior and knowledge of the stimulus situation we are able to reach conclusions regarding the

method of mental processing and the laws which govern it.

The reaction of an individual is not dependent solely on the given external stimuli but also on inner factors (e.g. performance of sense organs, understanding of the problem, experience, ability to concentrate, etc.). We are concerned here with another type of variable, which is defined as the O (organism) or P (person) variable. Every reaction can therefore be understood as a function of stimulus variables (S) and personality variables (P):

$$R = f(S, P).$$

Studies with S variables as independent variables form part of general psychology (q.v.); studies of P variables as an independent factor are the subject of differential psychology (q.v.).

The diagram we showed initially, which describes the procedures of psychology in a very general way, also enables the P variables to be included: if a_1 and b_1 are identical, while a_2 and b_2 differ, it is possible to conclude that there is a P variable effect which leads to differentiation. In addition, it should be stressed that this diagram not only holds good for research work but for practical operations.

2. The experiment. If an independent variable is intentionally varied under controlled conditions and its effect on a dependent variable observed, we have the basis for an experiment. The essential features of the experiment, i.e. its regulability, repeatability and variability, offer several methodological advantages: the observer does not need to wait for the process in which he is interested to occur naturally: he can create suitable conditions for the observation, eliminate interference and prepare aids (e.g. measuring and recording instruments); above all he can keep the experimental conditions largely under control. By repeating an experiment, earlier results can be checked and random errors will be compensated in a mean value from several observations; a high degree of objectivity can be achieved. Individual conditions

can be changed in further experiments, one variable being altered on each occasion in accordance with the rule mentioned above. It is then possible to explain gradually the significance of the individual conditions in the process as a whole and express it in the form of laws.

Special importance attaches to experiments through their interaction with the definition of theories: a theory provides a hypothesis to answer which the experiment is set up. The results of the latter may consolidate the theory or lead to its correction.

The experimenter (E) creates a given stimulus situation in a psychological experiment and studies individual variables from this complex. He observes the reactions of an experimental subject (S.) or animal. Depending on the subject's reactions, we make a distinction with W. Wundt between introspective and psychophysical experiments (or with H. Rohrer between experiential and performance experiments). In the first case the experimenter and subject are both observers and have to describe their impressions. In the second instance the reaction which is to be observed consists solely of a physical change, an expressive phenomenon. The reaction types are the same in experimental observation as in ordinary observation, but through the design of the experiment their determination is generally more precise and a better association with the releasing conditions can be ensured.

In introspective experiments, the subject may either be told to use only specific categories of judgment (fixed observation) or to make the communications which he feels important on a free basis (free observation).

To take the distinction between types of experiment further, there are also analytic and decision experiments. These are concerned primarily with the accuracy of the hypothesis, and are therefore gradual.

By a suitable arrangement of the variations in a test series, it is possible to study several independent variables very economically in a single process, but the effects of each

individual variable are still distinguishable. The effects of the combination of these variables (interactions) can then also be determined (see *Variance, analysis of*).

Experiments are used effectively in almost all branches of modern psychology. They cannot, of course, be conducted if the stimulus situation cannot be established (e.g. accidental influences), and their significance may be impaired if the subject's knowledge of the strictly experimental nature of the process influences his reactions (e.g. in motivation research) or if the factors involved are difficult to control (e.g. in social psychology). The fact that many experiments cannot be repeated usefully with a single subject is of little importance in general psychology because other subjects can always be called in.

3. *The test.* Diagnostic tests are used to determine the level of individual P variables. For the results to be comparable, the test must be conducted in an identical manner for all test subjects; the derivation from S variables is not acceptable. Of course no attempts are made to change the P variables which have to be diagnosed. Provided it has purely diagnostic purposes a test can therefore be considered as a kind of measuring instrument.

The question as to whether a test can be considered as an experiment is given different answers depending on whether the condition variation is considered essential for an experiment or not. If we understand the experiment in the wider sense as every voluntary organization of a process for observational purposes and make a distinction, as Pauli does (1927), between complete experiments (with condition variation) and incomplete experiments (without such variation), the test is then seen as an incomplete experiment.

Tests are important research instruments in differential psychology. If, e.g. we wish to examine different social groups to determine differences in their intelligence structure, we shall use suitable tests for this purpose (see *Intelligence tests; Psychodiagnostics*).

4. *Errors.* Any alteration in a dependent variable which is not conditioned by an

alteration in the independent variable under study, is an error. The origin of errors may be traced back to every stage of the study (e.g. in planning, practical observation or in the accompanying conditions). A distinction is made between systematic (constant) and random (variable) errors. Systematic errors influence all the individual results in the same manner and therefore shift the overall result in a given direction. Random errors, on the other hand, occur in all probability just often as positive or negative deviations from a true value, and leave the mean value of several identical observations unchanged. Errors may occur—depending on the underlying causes—in different ways, e.g. as space and time errors in determining stimuli or as errors of expectation in the subject or experimenter.

Psychological methods center in large measure on the avoidance or reduction of errors. Systematic errors are countered in particular by control methods and random errors by statistical methods.

5. Control methods. Systematic error factors must be removed before the study begins. Control measures are therefore a part of the experimental set-up. If an interfering condition is already known (e.g. noise), it may be eliminated directly. Other interfering variables may be known but impossible to eliminate (e.g. time of day at which experiments are conducted).

They must therefore be distributed over the conditions to be studied in such a way that they have an identical influence on the results to be compared (balancing). This is possible also in the case of interfering conditions which are neither known nor possible to eliminate (e.g. aptitude and personality characteristics of test subjects), by distributing them in a random manner between the categories of variables which are studied (e.g. allocation of a subject to an experimental or control group by drawing lots). A refinement of this method, which is known as "randomizing", consists in "parallelizing" after the results of a preliminary experiment.

6. Statistical methods. Even if all systematic errors are eliminated by extremely careful control, the variables which are irrelevant to the purpose of the experiment remain. Except in cases where such factors are directly eliminated, their effects are simply distributed in such a way that the overall result is one of neutralization. They continue to exist but only lead to random dispersion of the results obtained under identical known conditions.

For this reason, the laws followed in psychology are statistical. Accordingly psychology must use statistical methods in processing its results.

Having regard to the relatively large random error, almost all practical findings must be taken repeatedly. A sampling of identical observations must therefore be taken. It will then be possible to determine a characteristic value which will approximate more closely than each individual result to the true value uninfluenced by errors. This characteristic value is very often the arithmetic mean or a percentage figure. (Information on this aspect of methods of psychology will be found in various articles in the Encyclopedia: e.g. *Test theory*; *Statistics*; *Correlational techniques*; *Significance*; *Hypothesis testing*; etc.).

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Methohexital (*Methohexital sodium*; *Methohexitone*; *Brevital*). A psychotropic barbiturate.

Methohexital is very briefly acting and has been administered intravenously to support relaxation in behavior therapy (desensitization). Several studies show that methohexital may enable the duration of behavior therapy to be shortened. However, it remains to be shown whether there is then a greater probability of regression.

Bibliography: Brady, J. P.: Drugs in behavior therapy. In: Efron, D. H. (Ed.): Psychopharmacology, 1957-1967. Washington, 1968. *W.J.*

3-Methoxy-4-hydroxymandelic acid. The most important decomposition product of endogenous noradrenaline (q.v.), detectable in urine.

Bibliography: Crout, J. & Abraham, D.: Determination of 3-methoxy-4-hydroxymandelic acid. Clin. chem. Acta, 1962, 7, 285. Steinberg, H., et al.: Catecholamines and their metabolites in various states of arousal. J. Psychosom. Res., 1969, 13, 103-8.

W.J.

Methylphenidate (*Methylphenidate hydrochloride; Ritalin*). A stimulant which has a damping effect on the limbic system but, unlike the amphetamines, does not lead to an increase in adrenalin secretion. Effects on the autonomic nervous system are less pronounced than is the case with the amphetamines and caffeine. Psychopharmacological studies have shown the following results in doses of 10-30 mg: primarily an improvement in attentiveness (especially in neurotics), mood and performance in clerical tests and in various motor tasks. Paradoxical effects occur under certain conditions. There is a complex interaction between dosage, personality features, situative factors and the effect of the substance.

Bibliography: Janke, W.: Experimentelle Untersuchungen zur Abhängigkeit der Wirkung psychotroper Substanzen von Persönlichkeitsmerkmalen. Frankfurt, 1964. *W.D.S.*

Metromania. A pathological condition characterized by the incessant writing of verse.

Metromorphy (*Metromorph*). According to Conrad's typology (1963), a physical form which represents a harmonious balance between the two typical forms of leptomorphy and pyknomorphy.

Bibliography: Conrad, K.: Der Konstitutionstypus. Berlin, 1963. *W.Se.*

Metronome. A device for marking off short periods of time, usually by means of a pendulum which produces an auditory click at the end of its arc. Most commonly used for setting the tempo in musical rehearsal, but has psychological applications, e.g. pacing of speech in the treatment of stammering.

G.D.W.

M-F index. According to L. M. Terman and C. C. Miles, as well as S. R. Hathaway and J. C. McKinley, a scale for measuring the inner masculinity or femininity of a person. It covers the relative frequency of male and female personality traits, attitudes and behavior.

Bibliography: Hathaway, S. R. & McKinley, J. C.: Minnesota Multiphasic Personality Inventory (Manual). New York, 1951. Terman, L. M. & Miles, C. C.: Sex and personality: studies in masculinity and femininity. New York, 1936. *W.T.*

Michotte, Albert, Baron van den Berck. B. 13/10/1881, in Brussels; d. 1965. Began his teaching career in 1905 after graduating in philosophy at Louvain University, where he was first appointed assistant, then a lecturer, and put in charge of the psychological laboratory in 1908 as Professor. He held this position for twenty-five years; in 1906 he worked in the Leipzig psychological laboratory and went to Würzburg under O. Külpe in 1907/08; in 1923 he founded the Ecole de Pédagogie et de Psychologie appliquée à l'Education at Louvain University: it was renamed the Institut de Psychologie appliquée et de Pédagogie in 1944. In 1957 he founded the Société Belge de Psychologie and in that

year was appointed Chairman of the 15th International Psychological Congress. He was Chairman of the International Union for Scientific Psychology until 1960.

Works: Michotte's research activity can be divided into three periods. In the first, lasting from 1905 to 1920, he showed close affinities with the Würzburg School in research methods and content. Concentrating on the systematic introspection method, he studied higher psychological processes such as thinking and volition, determining trends, logical memory, origin of meanings, etc.

In the second period he was influenced by behaviorism and criticism of the method of systematic introspection and began to study problems such as visual and tactile-kinesthetic perception, stroboscopic perception (see *Stroboscope*), rhythm, motor learning, etc.

By far the most original and important research for which he was responsible was done between 1940 and 1965 when he studied problems of causality perception, phenomenal permanence and amodal additions to perception structures.

In his experiments in apparent causation he tried to show that the determination of causal relationships between objects, i.e. the evaluation of the influence of one object on another, is a genuine direct, perceptual phenomenon which occurs in a given stimulus configuration with the same perceptual evidence as any other perception quality. He thus opposed the previously held view that causal relationships are not perceived directly but only inferred indirectly from previous experience and the sense relationship which is apparent in a situation. His studies of amodal additions to perceptual structures were also of far-reaching importance. Michotte established a distinction from modal completions (*Hemianopsia*; *Blind spot*) and speaks of amodal completions when the added components have no sensory qualities in the true sense of the word (brightness and color), while the unity of the overall gestalt and the complete nature of its outline have the force of perceptual evidence. Michotte tried

to refute, on the basis of his experiments, the previously held opinion that these completion phenomena do not have the qualities of perception but are conditioned solely by experience, knowledge and reasoning processes; he tried to show that they are genuine perceptual phenomena which are influenced only by the normal laws of organization of the field of perception.

Publications: La perception de la causalité. Louvain, 1946 (Eng. trans.: The perception of causality. New York, ²1963). Autobiography. In: Boring, E. G., et al. (Eds.): A history of psychology in autobiography, Vol. 4. Worcester, Mass., 1952, 213–36. Causalité, permanence et réalité phénoménales. Etudes de psychologie expérimentale. Louvain, 1962 (Michotte and colleagues). Les compléments amodaux des structures perceptives. Louvain, 1964 (with G. Thines and G. Crabbé).

W.W.

Microcephaly. Abnormal reduction in the size of the head and brain with skull deformations, mental deficiency and impaired functioning of the central nervous system. Sometimes linked with hydrocephaly (an excess of cerebrospinal fluid). Microcephaly may be innate or caused by various prenatal disorders (rubella or toxoplasmosis). It is incurable.

E.D.

Micropercepts. The perception of very small differences in any modality, e.g. pitch discrimination and *differential running time* (q.v.) in the location of sound.

C.D.F.

Microvibration. An uninterrupted vibration of the body surface with amplitudes of 1–20 microns and frequency components of 2–60 Hz (dominant frequencies 8–20 Hz). The amplitude and frequency of the microvibration vary with the point of measurement on the body and the activity of individuals: they increase with the occurrence of affects, under mental and physical stress and after administering stimulating drugs, and fall off

in relaxing situations and after administering sedatives. Microvibration probably plays a part in regulating temperature and was described for the first time by Rohracher in 1946.

Bibliography: Rohracher, H. & Inanaga, K.: *Die Mikrovibration*. Berne, 1969. *W.Sch.*

Middle ear. See *Auditory ossicles*.

Migration. Animal migrations are still mysterious phenomena. The parr (young salmon) recognizes the effluvial spectrum of its home river four to five years later when, having traversed thousands of miles of ocean, it returns to breed. At spawning time, toads find their original pool. The Pacific golden plover migrates from Alaska to Hawaii, and crosses 3200 km of ocean. Readiness to migrate in fish, amphibia and birds is influenced by length of day, temperature and hormonal balance. Not only landmarks but the sun, polarized light, and possibly the stars, as well as magnetic fields, play a part in distance orientation—there is also genuine navigation. Even some insects may be said to “migrate”. Some 500,000 locusts per hectare fly 15 km ahead of the wind that brings them into areas where rain will fall and eggs can be laid.

Bibliography: Eastwood, E.: *Radar ornithology*. London, 1967. Harden Jones, F. R.: *Fish migration*. London, 1968. Hediger, H. (Ed.): *Die Strassen der Tiere*. Brunswick, 1967. Nielsen, E. T.: *Insekten auf Reisen*. Heidelberg & New York, 1967. Salomonsen, F.: *Vogelzug*. Munich, 1969. *K.Fi.*

Migration instinct. An “instinct” (q.v.) evoking and maintaining migratory behavior (in birds, fish, insects). Hormones (thyrotropine, thyroxine, prolactin) play an important part in the motivation of animal migrations, as do temperature variations and changes in the length of the day, lack of food and overpopulation (e.g. lemmings). See *Migration*.

Milieu. An imprecise designation for that aspect of an individual's environment which primarily comprises economic, cultural and inter-human factors. *M.A.*

Military psychology. The development of military psychology dates from World War I, and runs largely parallel to the differentiation of applied psychology into its various specialist branches; its tasks and the areas into which it was chiefly brought into use depended upon the needs of the changing situation in the armed forces and upon the contribution which psychological knowledge could make to those military spheres which are particularly affected by marked psychological variations in the fighting man. Starting from 1915, American psychologists (R. H. Yerkes, H. H. Goddard, L. M. Terman) succeeded in selecting some 1.75 million men for military service using the Army Alpha Test (later Army General Classification test, q.v.) to assess their intellectual and behavioral levels. The use made of research statistics in test construction (q.v.) and validation (q.v.) made this remarkable achievement possible for the first time. German war psychology enjoyed a pre-eminent position in the field of military psychology by reason of its holistic tests in real-life situations and development of personality assessment along individual diagnostic lines (Lersch, Eckstein, Rudert, Simoneit). (See *Personality*.)

During and between the two last wars the methods used in the selection of pilots, lorry drivers and specialists became more sophisticated (e.g. in the psychological laboratory before and after 1935: perception experiments based on the physiology of the senses, the development of reaction-timing devices, and also tests for assessing technical competence and determining suitability for training as wireless operators, monitors, etc.). Because of the rapid development of modern systems of weapons and leadership, with the increased demands they made on military science, logistics and infrastructure, and with the

adaptation of the military forces to social systems with an emphasis on performance, military organization was confronted with completely new tasks. Which particular kind of psychology receives most attention in a given country, whether it is social, clinical, technical, or the psychology of training or aptitude, varies according to tradition (for instance, in the Latin countries medicine takes pride of place, in the Eastern it is neuropsychology, and in the Anglo-American and Scandinavian countries there is close co-operation with civilian research work. Between the military psychologists of the NATO powers (but also with countries outside this organization) there are part-agreements on the exchange of information which largely relate to the following main areas of military psychology:

1. *Man-power resources*: psychology of military reserves; selection and drafting of conscripts and volunteers by means of paper/pencil and functional tests.

2. *Personnel selection and classification*: psychological examinations and investigations of military personnel required for special duties and activities. The selection methods for pilots (begun in World War I) call for special attention: as ever more demanding aeroplane types were developed, methods with wide ramifications were worked out, including the use of flight simulators (assessment of the potential skill of the subject in visual flight and also when flying blind). (See *Aviation psychology*.) (cf. O.S.S., 1948.)

3. *Human factors engineering* (ergonomics, anthropotechnology, or the psychology of military technology): investigations by experimental psychologists to determine the optimal adaptation of a man to weapons and appliances and, on the other hand, the optimization of control devices for assessing a man's capabilities. Analyses of stress, work study and ergonomics evaluation of war material enable the degree of efficiency to be increased where man-machine systems are involved (instrument design for tanks, submarines and high performance aeroplanes).

4. *Training and military education*: development and overhaul of training methods (rational instruction planning, programmed learning, including proficiency measurement methods for calculation of levels reached by military units at different stages of their training).

5. *Human relations and morale*: socio-psychological investigations to determine human relationships in a unit (group dynamics), style of leadership (see *Leader*), motivation (q.v.), behavior in critical situations (collapse of discipline, desertion, etc.). These subjects have for decades been the subject of intensive research, the results of which have been made available only in part. In the USA almost every third publication deals with some aspect of military psychology. At NATO work conferences and international symposia the results of projects are released and discussed. See *Traits*; *Type*.

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G. Mitze

Mimicry. An imitation (which occurs as a result of natural selection) of a feature which is dangerous or disagreeable to a potential enemy. For example, the markings on the back of the body of certain hovering flies are similar to those of wasps, so that these flies are not touched by certain predators which avoid wasps because of their sting.

H.Sch.

Mind. Until a psychology with a scientific orientation was created, psychological inquiry and thinking were concerned with the mind, its substantiality, spirituality and mortality. The

mere fact of talking about a mind serves to distinguish it from the body to which it is bound. Thus the theory of mind raises the mind-body problem (q.v.). Investigation of the mind and its relation to the body was the special task of rational or metaphysical psychology, which was and is a branch of philosophy. When, about the middle of the nineteenth century, psychology was detached from philosophy and turned to science and its methods, it considered its subject to be those psychic processes whose totality W. Wundt sought to embrace in his *actualistic concept of mind*. The term coined by F. A. Lange, "psychology without a soul", is on the whole correct for modern scientific psychology. Nevertheless, the question concerning the real essence of the problem of mind persists. The term *mind* had the *function of a concept distinguishing it from body*, the function of a lasting substratum of psychic processes, and the mind had the *function of a standardized basis of psychic life* in the sense of continuing process, identity of subject and constancy of object recognition. These basic functions have today been transferred to the concepts "person" (q.v.) and "personality" (q.v.). As compared with the concept of mind they have the advantage that they include the relation of the psychic life to the body and the world. On the whole psychology, in so far as it considers itself a "pure", empirical science, cannot decide the problem of mind, but its voice must certainly be heard in any decision. L.J.P.

Mind-body problem. I. The mind-body problem is rarely defined in detail in contemporary psychology. Nevertheless it is a genuine problem and its existence can be demonstrated. Certain modern research concepts make allowance for it without acknowledging the fact. It can be considered on the basis of the principle of conflict or identity or alternatively by a combination of these two principles. This is confirmed by the history of psychology and is required by logic. From

the standpoint of modern psychology the emphasis must be placed on the functional rather than the substantial aspect of the problem.

If it is approached from the principle of conflict (i.e. dualistically), the theory of interaction can be used to explain the functional relationship between mental and somatic processes: physiological processes "cause" mental correlates, and vice versa. Psychosomatics (q.v.) and psychopharmacology (q.v.) are based on this principle; traumatic experiences lead to somatic disorders of a functional and organic nature. Drugs have a specific influence on the mental state. Here we encounter an "empirical" (Jaspers, 1960) dualism of functions between which there is no bridge, because neither the Cartesian "*spiritus animales*" nor the Leibnizian "*deus ex machina*" are scientifically tenable constructs. Recently Wellek (1958) has defined an empirical dualism: "Monism is theory, dualism experience." The existence of conflicts in the personality tends to support this theory (e.g. the conflict between hunger and a desire to fast); it is also supported by the terminology concerning the mind-body problem: psychophysics, psychophysically neutral, psychosomatic, mind-body unit, etc.

From the standpoint of the identity principle in contemporary psychology only the physiological-materialistic concepts remain relevant: mental phenomena are derivatives of processes in the muscles, nerves and brain. For the development of psychology these assumptions have the advantage that they clearly emphasize the importance of the body as distinct from the metaphysical approach. The solutions to the mind-body problem indicated by most authors under the heading of "identity" are located, in accordance with the distinction made here, "substantially and functionally" between the two extreme solutions described above and therefore combine the two principles. This applies to Spinoza, who is considered as the prototypical philosopher of "identity", but only in respect of his single substance theory. To the extent that he

defines the mind and body as two attributes, he obviously introduces dualism in the sense of a bilateral theory. Leibniz's concept of parallelism must be considered in the same light: he refers to unity in the substance and duality in the function (two clocks keeping time with one another). All the modern parallelists, such as G. T. Fechner, W. Wundt, G. E. Müller (with his five psychophysical axioms) as well as W. Stern (and his personalism) come under the same heading: personal processes are "psychophysically neutral", i.e. they cannot be clearly attributed to one side or the other. Empirical evidence is provided by the phenomena of expression and the motor system. Köhler's theory of isomorphy (1920—modified by Metzger, 1954) belongs to the same group: he does not refer explicitly to a substantial carrier but his theory has a dual functional basis: the cerebral and perceptual *gestalts* are of analogous structure. Finally the principle of complementarity taken over from physics by N. Bohr and applied to the mind-body problem deserves mention here: physical and mental processes must be described and explained individually but are complementary to the extent that they relate to the same phenomenon, as is the case with the corpuscular and wave theories of light. *Methodical dualism* would probably be acceptable as a description of the attitude to the mind-body problem in contemporary psychology: every psychologically relevant process or state must be described, analyzed and interpreted through its physical (neuro-physiological) and psychological (experiential) coordinates.

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L. J. Pongratz

II. The problem from the standpoint of natural science. All our conscious processes and states are dependent on the brain, as is demonstrated by the following facts: (a) if the brain becomes unable to function as a result of chemical or mechanical influences (narcosis, injury), all psychological activity ceases; (b) changes in our brain activity due to the administration of certain substances (alcohol, opium, morphine, LSD, etc.) lead to changes in our conscious experience; (c) failure of specific areas of the brain (see *Brain pathology*) results in the breakdown of certain psychological functions (aphasia, agnosis, alexia, etc.); (d) there is a phylogenetic and ontogenetic parallel between the development of the brain and mental development. It follows that all forms of conscious experience are based on specific brain processes; brain processes form the indispensable prerequisite for psychological activity—but we do not know whether they are also a sufficient basis for it (other conditions may also have to be met before conscious experience becomes possible). The mind-body problem can therefore be reduced to two questions: "What happens in the brain when we experience something?" and "What is the causal relationship between psychological and cerebral processes?" The first question can in principle be answered reliably: during all conscious experience an enormous number of electrical and chemical processes take place in the ganglionic cells and fibers of the cerebral cortex (nervous system). The resulting "excitation constellations" must be "specific", i.e. a separate excitation constellation corresponds to each individual content of our conscious experience; there must therefore be at least as many excitation constellations as there are contents of experience.

The answer to the second question ("What is the causal relationship between psychological and cerebral processes?") is dependent in large measure on the importance attached to the "difference in nature" between the two processes; it consists in the

fact that the psychological processes are non-physical (they are not made up of atoms and molecules and are largely independent of space and time), while the cerebral processes belong to the organic-material sphere. The old mind-body theories overlooked this distinction and held that there could be an interaction (interaction theory) between physical and mental processes or that they could be two aspects of the same process ("una eademque res, sed duobis modis expressa"—Spinoza's two-aspect theory). Because of the absolute dependence of the psychological processes on the brain, both theories were faced with logical difficulties: an influence of conscious experience on the brain processes in the sense defined by the interaction theory would only be possible if this experience were at least intermittently independent of the brain; the two-aspect theory does not answer the question of causal relationships. New theories have tried to explain the dependence of psychological processes on cerebral activity and the difference in nature between them by the assumption that conscious experience is an effect of the brain processes but cannot itself act on the latter ("theory of the ultimate effect," Rohrer, 1967), or that the brain processes are an indispensable (but not sufficient cause of conscious experience) which cannot develop without a further, unknown natural force which uses the brain as a tool or instrument for the production of the mental processes ("instrumental hypothesis"). The natural-scientific approach to the mind-body problem is best reflected in the "theory of the ultimate effect", which fully recognizes the special character of psychological processes—immateriality, considerable independence of space and time—as well as the absolute dependence of the psychological processes on the brain. For natural-scientific psychology, the conscious experiences are biological phenomena; they help to maintain life and individuality (e.g. the vital and social drives) as well as cultural progress (interests or cultural drives). The mental processes can be considered as the highest expression of

natural development and as the ultimate effect of the organic process as a transcendental expression of the material process in immaterial subjective experience. This theory, too, leaves many questions open (above all the way in which conscious experience has developed from electro-chemical processes in the cerebral cortex); its advantage lies in the fact that it avoids the logical difficulties inherent in the assumption of a "feedback" effect of psychological processes on physical activity.

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Minimal changes method. A standard psychophysical procedure for estimating an absolute or differential sensory threshold. The variable stimulus is progressively changed (e.g. increased in intensity) until it is either *just noticeable* or *just noticeably different* from a constant comparison stimulus. A number of such trials are run and a statistical average calculated. Syn.: *Method of limits; method of least differences; method of just noticeable differences.* G.D.W.

Minimum audible. The threshold of audibility; the minimum sound intensity of certain parts of the sound spectrum which is just audible. A.Hä.

Minimum separable. The simple separation capacity of the normal eye (see *Sense organs*: the eye). The minimum separable denotes the minimum angles between two points which are perceived as separate points: or, the least separation at which two parallel lines are perceived to be separate. It is measured in terms of vision and is dependent on many variables, such as the luminous density of the field of vision, contrast, surrounding and environmental factors, adaptation, etc.

A.Hä.

Minimum visible. Threshold of visibility: the minimum amount of light with specific duration and specific spatial extent which is just visible (see *Threshold*). The minimum visible is dependent, e.g. on the luminous density of the light, the duration of the light effect and the extent of the light stimulus.

A.Hä.

Minnesota Multiphasic Personality Inventory (abb. *MMPI*). The MMPI was developed by S. R. Hathaway and J. C. McKinley (1940, 1951). It consists of a subjective personality inventory designed according to psychiatric criteria, and has 566 questions which are summarized in the following ten clinical scales: (1) hypochondria (Hd); (2) depression (D); (3) hysteria (Hy); (4) psychopathy (Pd); (5) masculinity-femininity (Mf); (6) paranoia (Pa); (7) psychasthenia (Pt); (8) schizophrenia (Sc); (9) hypomania (Ma); (10) social introversion-extraversion (Si), and four "validity scales": (1) "?" value = questions which are not answered; (2) L (lie) value = tendency for the subject to place himself in a favorable light; (3) F value = unusual answer to questions to which almost all subjects give an identical answer; (4) K value = tendency to make a normal impression (used as a correction for other scale values). Various authors have suggested other scales (more than 200). The test profile of the personality scales is usually interpreted. The retest-

reliability coefficients of the fourteen standard scales are between $r = 0.46-9$ (average value $r = 0.75$). In spite of many studies, the validity of the individual scales has not been conclusively demonstrated. See *Personality; Questionnaires; Traits; Type*. *P.G.*

Minnesota Rate of Manipulation (W. A. Ziegler). A revision of the Minnesota Manual Dexterity Test which determines the speed at which manual work is done. Pegs have to be inserted as quickly as possible into a board with sixty holes. There are five different exercises to be attempted. The test is suitable for selecting adults for jobs requiring simple manipulations. No verified standard values or authenticated pronouncements on validity (q.v.) are available. The value for repetition reliability is roughly $r = 0.8$. *F.Ma.*

Minority. A numerically small group in a society or nation which differs from the majority of the population in respect of special features, e.g. level of income, extent of political influence, skin color, religious or political beliefs are minorities; the social range in such a group is small but relatively large in relation to the rest of the population.

A minority may become a minority group if it develops into a stable sub-group within the society, representing interests which are apparently or actually different from those of the majority (hostile attitudes of the majority toward minorities). The extent of the rejection of members of a minority group is dependent among other factors on the development of certain social attitudes in the majority, e.g. ethnocentrism, authoritarianism or nationalism. See *Attitude*.

Bibliography: Horowitz, E.: Development of attitude towards negroes. In: Newcomb, T. M. & Hartley, E. L. (Eds.): Readings in social psychology. New York, 1947. *A.-S.M.*

Mirror writing. An experimental arrangement in transfer research. Numerous experiments

in the transfer (q.v.) of sensorimotor skills have shown that children who have been trained to write with the right hand do well when they mirror-write with the left hand.

H.W.

Mirror-writing device. Used to test the coordination of hand and eye under difficult optical conditions. The test subject has to do a tracing of a more or less complicated, prepared drawing (usually a geometrical pattern made from two parallel lines) which he cannot see directly but only in a mirror, turned laterally the wrong way. For measuring the performance, the time taken to run completely through the figure and the number of occasions when the prepared tracing is touched or crossed are usually taken into consideration.

A.T.

Miosis (syn. *Myosis*). Contraction of the pupil by stimulation of the parasympathetic system or paralysis of the sympathetic system. Occurs, e.g. in neck tumors or injuries through lesions of the sympathetic nerves (Horner's syndrome), and in morphine poisoning, etc. Ant. *Mydriasis*.

R.R.

Mira myokinetic test. See *Myokinetic test*.

MMQ. Abb. for Maudsley Medical Questionnaire (Eysenck, 1947). See *Maudsley Personality Inventory; Questionnaires*.

Mneme. Memory (retention of past events). Anamnesis; recalling and reproducing stored information. According to Semon (1908) a general function of "organic matter", the totality of engrams.

Bibliography: Semon, R.: Die Mneme als erhaltendes Prinzip im Wechsel des organischen Geschehens. Leipzig, 1908.

H.W.

Mnemonics; Mnemotechnics. Improvement of memory performance, e.g. by systematic practice in particular by using special aids to learning (e.g. diagrams, rhymes, graphic presentations). **Mnemometer:** a memory device used by Rauschburg, N. Ach and O. Lipmann to check the time for which syllables to be learnt by a subject are presented to him and the method by which they are presented.

H.W.

Mnestic disorders. Memory disorders, in particular difficulty in retaining past occurrences.

H.W.

Mob. An uncontrolled and/or violent crowd. See *Aggression; Crowd behavior*.

Modal personality. A term offered by Linton (1945) for the personality type which is most frequently encountered in a given society or culture and by which the cultural background is formed in any given instance.

Bibliography: Linton, R.: The cultural background of personality. New York, 1945.

H.J.A.

Modal value. A statistical characteristic for the central trend. The modal value is the value in a frequency distribution which shows the highest frequency, i.e. the base of the "peak" ordinate of a distribution. Determination of the modal value is only meaningful in the case of large samples and single-peak distributions. The modal value is used as the characteristic for the central trend of a distribution of discontinuous variables.

G.Mi.

Model; model thought. A system M is known as the "model" of a prototype P if M and P are analogous but do not directly interact and if M is used to obtain information on P on the basis of the analogous relationship. The additional requirement that M should

help to provide perceptual information is no longer applied as a result of the development of formal (e.g. mathematical) models. The prototype of a model in psychology is always part of its objective range. *W.H.T.*

Model psychosis. The psychopathological change induced in a normal individual by the administration of a psychotomimetic drug such as mescaline, LSD or psilocybin. *J.P.*

Models. 1. *Definition.* Models, or model concepts, exist in psychology wherever known, real or constructed systems are used as analogies for areas of behavior and/or experience. Model concepts associate individual behavior patterns, experiences and/or situations (stimuli) with parts of another system which generally does not originate in psychology, in such a way that specific relationships between the patterns of behavior, experiences and/or situations are illustrated by relationships in the model system. Although the model does not claim to cover completely all relationships in the given area of research, the model system nevertheless also contains "model-specific" relationships in respect of which it is not known whether they correspond to relationships in the objective range. These relationships may be used in part as the basis for deriving new research hypotheses.

2. *Development of the model concept.* According to Frey (in Kazemier & Vuysje, 1961, 89) the old High German "model" in medieval architecture represented one half the diameter of a column. The present word "model" first appeared (in Germany) in the sixteenth century as a derivative of the Italian "*modello*" and defined a pattern on the basis of which something else was manufactured. Today the term "model" denotes not only such patterns but objects which represent given patterns.

In mathematics and formal logic, a model

is the interpretation of a "calculus". Object classes are associated with specific calculus signs in such a way that relationships between the object classes are represented by operators or relationship characteristics.

In the empirical sciences, a model is initially also the interpretation of a theory. To the extent that the latter contains concepts which have no observable corresponding features in the objective range, a different interpretation of the same theory may associate these concepts with better known factors which can sometimes be presented in a representational form. In Bohr's atom model, for example, electrons are represented as objects located at specific points in space and circling round an atom nucleus. Psychoanalytical theory employs the physical analogy for energy as the model of the theoretical concept of libido (q.v.).

While some authors (e.g. Dessauer, 1958, 225 ff) consider representation to be the essential feature of a model, there has been a growing tendency to define analogous systems which merely represent formalisms, as models. The multi-dimensional scaling which is widely used in psychology is based on a model in which stimuli are represented by points in a metric space in such a way that greater subjective similarity between two stimuli corresponds to a lesser distance between the associated spatial points. It is questionable whether we should speak here of "model" concepts. The representability of the spatial model is, to say the least, doubtful as soon as the space consists of more than three dimensions or has a non-Euclidean basis. In this case the model concept cannot imply that a specific model system can be represented perceptually but only that we imagine that the characteristics of the given research area behave in a manner similar to the parts of the model that is used.

3. *Black-box method.* The construction of model concepts can often be interpreted as the use of the black-box method. The black box is a box which responds through specific reactions (pointer deflections, illumination

of lights, etc.) to possible manipulations (pressure on a button, lever operation, etc.) whose content is, however, unknown. After adequate observation of its behavior a second box, i.e. the white box, with a known content and an analogous behavior, can be built. Groups of manipulations (or manipulation sequences) and groups of reactions (or reaction sequences) can then be grouped together in categories. Each category A,B... in the black box must correspond to a category A', B'... in the white box in such a way that the black box reacts to A with B precisely when the white box responds to A' with B'. If common designations for the corresponding categories are introduced we can establish a sequence of manipulations in this language and complete the operations of both systems simultaneously; it must then be possible to prepare reaction reports in this language which are not distinguishable from each other (Turing criterion).

The black box and white box are parts of a model concept of model concepts. The black box should correspond to the given research subject, i.e. the living organism with its unknown inner psychological life, and the white box to the associated model. Modifications are possible if we are content—as is generally the case in practice—to consider only a few relationships (“very large box”, Ashby, 1961, 109 ff), or if the relevant relationships can be observed only in part (“incompletely observable box”, Ashby, 1961, 113 ff). There is then a risk that relevant aspects of the prototype will not be represented in the model, or that model-specific characteristics will be interpreted wrongly as representations of prototype aspects (“first and second order errors,” according to Simon & Newell, 1963, 91 f).

4. *Types of model.* A distinction is made between physical models (material models, replica models) in which the analogous system is a perceptible object, and perceptive models or conceptual (linguistic) models. Formal models are a major special group; in this case the model system is a calculus. If the

latter is obtained from an area of mathematics, we speak of a “mathematical” model.

In the last twenty years the scope and importance of mathematical models in psychology have grown considerably and led to the clear development of a “mathematical psychology” (q.v.) (Luce, Bush & Galanter, 1963/65). To characterize the part area of mathematics from which the model calculus is taken, we define a model, e.g. as algebraic, probabilistic or stochastic, etc. While some systems are used in diverse research areas (for instance, the factor analytical model), others are tailor-made for specific areas (e.g. learning models, decision models) but can still be transferred to others. In social psychology, for instance, we find forms of calculus which were first developed in general psychology (Tack, 1969, 488 ff).

We speak of a *simulation model* if fixed values are inserted in a formal model with variables in order to determine the values which are then assumed by other variables. Computers are often used for this purpose, the model being programmed on the machine. Cybernetics offers a whole range of concepts from which models can be constructed in many branches of science; these models are then referred to as “cybernetic” models. See *Cybernetics and psychology*.

5. *Function of models.* Model concepts transfer new knowledge to areas which are more familiar; therefore they represent a bridge to easier understanding. They are used for integration by representing diverse findings in a common system from which hypotheses can be derived in regard to still unknown facts. Formal models make less claim to completeness than traditional theories. On the other hand they offer more precise rules for classifying statements.

Models do not claim to represent a research subject in isomorphic form. In psychology they are limited to aspects of man or other organisms which can be represented by analogy. This form of representation of human behavior must not be misunderstood as an equation of man with a given

model system. See *Decision processes; Factor analysis; Machine learning*.

Bibliography: Ashby, W. R.: An introduction to cybernetics. London, 1961. Dessauer, F.: Naturwissenschaftliches Erkennen. Frankfurt a.M., 1958.

Kazemier, B.H. & Vuysje, D.: The concept and the role of the model in mathematics and natural and social sciences. Dordrecht, 1961. Luce, R. D., Bush, R. R. & Galanter, E. (Eds.): Handbook of mathematical psychology, Vols. 1, 2 and 3. New York & London, 1963-65. Simon, H. A. & Newell, A.: The use and limitations of models. In: Marx, M. H. (Ed.): Theories in contemporary psychology. New York & London, 1963, 89. Smith, K. U. & Smith, M. F.: Cybernetics: principles of learning and educational design. New York, 1966. Stewart, D. J. (Ed.): Automaton theory and learning systems. London, 1967. Tack, W. H.: Mathematische Modelle in der Sozialpsychologie. In: Graumann, C. F. (Ed.): Hdb. der Psychol., Vol. 7. Göttingen, 1969, 232. Turing, A. M.: On computable numbers, with an application to the Entscheidungs-problem. Proc. Lond. Math. Soc., 1936, 42, 230-65. Id.: Computing machinery and intelligence. Mind, 1950, 59, 433-60. W. H. Tack

Modesty. 1. Not presumptuousness. 2. Self-depreciation. 3. Conformity with the prevailing social, legal or religious norm of sexual display.

Modification. In individuals with identical hereditary characteristics, modifications may be caused by environmental influences, i.e. features may be formed differently but only within the limits of the modification range which is determined by heredity; e.g. certain plants growing in mountainous regions are smaller and have large amounts of hair while similar plants in lowland terrain are large and have no hair. H.Sch.

Molar. A term which psychology has borrowed from chemistry and which is used to denote larger units of behavior (events); its opposite is the term *molecular*, the name used for the smallest units of behavior (S-R relations). A stimulus-response pair can therefore be called a molecular, the running

of a rat through a maze, for example, a molar unit.

Bibliography: Tolman, E. C.: Purposive behavior in animals and men. New York & London, 1932.

R.Hä.

Molar analysis. The term denotes that form of psychological observation which carries out its investigations at a higher level than the smallest behavioral units (see *Molar*). The study of single events, of whole "episodes", right up to socio-psychological phenomena may be referred to as molar analysis.

Bibliography: Miller, D. R.: Study of social relationships. In: Koch, S. (Ed.): Psychology: A study of a science, Bd. 3. New York, 1963.

R.Hä.

Molecularism. See *Atomism*.

Mongolism (syn. *Down's syndrome*). So called because the facial appearance is said to resemble that of members of the Mongolian race. It is the commonest cause of mental subnormality, accounting for about 15% of patients in subnormality hospitals. Intelligence is usually at the imbecile grade, although idiocy and feeble-mindedness both occur with mongolism. The condition is caused by an extra chromosome and produces characteristic physical features such as short nose, large tongue which is fissured and often protrudes, hypotonic muscles and flabby skin. V.K.J.

Monoamine oxidase. A group of enzymes which act as catalysts in the oxidative decomposition of the biogenic amines (monoamines), tyramine, tryptamine, serotonin, noradrenalin, dopamine, etc. The breakdown of these substances can be inhibited by monoamine oxidase inhibitors. W.J.

Monoamine oxidase inhibitors. Psychopharmaceutical substances which are generally referred to in abbreviation as MAO inhibitors, MAOI, or MAO-I inhibitors, and

prevent the breakdown of biogenic amines by inhibition of monoamine oxidase so that its concentration in the brain is increased. Chemically, the MAOI can be divided into the hydrazines (e.g. iproniazide, nialamide) and the non-hydrazines. MAOI cause central excitation in animals. Preliminary application of MAOI cancels damping by reserpine. The introduction of iproniazide as an anti-depressant is explained by its activating effect in human testees. The indication area of pharmacotherapy with MAOI appears to be more strictly limited than in the case of other anti-depressants. In the case of unselected depressive patients, success therefore appears more limited (Davis *et al.*, 1968), although clear effects can be observed in atypical, non-endogenous depression (Cole *et al.*, 1961); the therapeutic effect is covariant with changes in concentration of the biogenic amines.

Bibliography: Cole, J. O. *et al.*: Drug therapy. In: Progress in neurology and psychiatry, Vol. 16. New York, 1961. Davis, J. M. *et al.*: Drugs used in the treatment of depression. In: Efron, D. H. (Ed.): Psychopharmacology, 1957-1967. Washington, 1968. Pletscher, A.: Monoamine oxidase inhibitors; effects related to psychostimulation. In: Efron, D. H. (Ed.): Psychopharmacology, 1957-67. Washington, 1968.

P.D.

Monochromatic. Radiation which consists of a single wavelength or more specifically of a single wavelength range.

A color is said to be monochromatic if its stimulus basis is monochromatic radiation; antonym: polychromatic color (= mixed color). See *Chromatic*.

A.H.

Monochromatism. An abnormality in eyesight; only differences in brightness are perceived instead of colors. In "typical" monochromatism, the retinal system of the cones does not function properly, while in "atypical" monochromatism the defect is localized in the upper nerve centers. Monochromatism is also referred to as *mono-*

chromasy. An individual with the defect is a *monochromat*.

G.K.

Monocular. Involving or affecting a single eye; as opposed to binocular = involving both eyes.

A.H.

Monomania. A mental disorder in which dominating and fixed ideas are prominent. The patient is usually well integrated in other ways, and responds fairly normally to situations which do not impinge on his delusional system. *Paranoia* is a possible synonym. R.H.

Monotony. A state of reduced psychological activity which results in heightened fatigue and reduced ability to react, and reduced and fluctuating performance as phenomena accompanying monotonous work. On the basis of his experiments with unvarying industrial work, Wyatt (1924) showed that monotony (boredom) is a more important factor than fatigue in determining performance. Monotony is characterized by a wave-like pattern due to the intermittent falling and rising of mental activity. The reduction of activity in a state of monotony is traced back to such factors as psychological stress and degree of interest (Bartenwerfer, 1970). Lack of variety and stimuli and constant repetition of the same process can be summarized as a reduction in the range of interest. As a result of the limitation of this interest, psychological attentiveness diminishes and this leads to a reduction in mental activity. To counteract monotony, attempts are made to increase interest in boring activities, e.g. by entertainment, music, movement and changes of activity. An effort of will to avoid a state of monotony in fact has the opposite result: because of the effort to concentrate on the boring activity, the subject is all the more likely to lapse into a state of monotony (and *fatigue*, q.v.).

Bibliography: Bartenwerfer, H. G.: Psychische Beanspruchung. In: Mayer, A. & Herwig, B. (Eds.):

Hdb. der Psychol., Vol. 9. Göttingen, 1970. Wyatt, S.: Monotony. London, 1924. Id. & Langdon, J. H.: Fatigue and boredom in repetitive work. (Industrial Health Res. Board No. 77). London, 1937. A.K.

Monozygotic twins. Twins that develop from a single egg. See *Twin studies*.

Montessori method. This theory of education, named after Maria Montessori (1870–1952) elevates spontaneous action by the child into an educational principle. The aim is to educate the child freely in the manner best suited to him, using his own mental powers and manual skills without special supervision. The critical objections to Montessori education challenge its overemphasis of free development, exaggeration of the value of natural behavior of children and general idolizing of the child. H.Sch.

Mood. A state of feeling of some duration in which the quality of the feeling (merry, sad, optimistic mood) and natural inclination to stability or fluctuation of this quality are distinguished. Factor analysis revealed a mood stability factor which belongs among factors of temperament. See *Traits*. G.K.

Mood transmission. The behavior of a group of animals is influenced by mood transmission. Often expressive movements promoting this function are the only ones to have been developed. When greylag geese are in the mood to migrate, they begin to wander about, shaking their heads with necks outstretched and calling until the whole flock are seized by the mood and fly into the air together. Yawning also has an infectious, sleep-inducing effect. (See *Ideo-real law*.) W.P.

Morale. A term which is generally an abstraction from individual adaptive behavior and denotes a positive attitude to a group, its

aims and leadership. In industrial psychology, a synonym for satisfaction in the working group with the result of a high readiness to work. W.D.F.

Morality. Since J. G. Fichte, two planes have been distinguished within the moral aspect of actions, one of a more subjective kind which concerns the inward observation of the rules of behavior (morality in the literal sense), and another of a more objective nature which—referring to society—embraces the totality of all kinds of behavior accepted by any cultural group. Thus morality is closely connected with that which forms the superego (q.v.) in the unconscious, or represents the basis for the ego ideal (q.v.) in consciousness. (See *Conscience*). P.M.

Morality principle. By analogy with the pleasure and reality principles, the controlling principle in psychological processes which seeks to establish concordance with (direct or introjected) motives of other persons, with rules and customs of groups of persons and with the norms of society. W.T.

Morgan's canon. The American geneticist T. H. Morgan demonstrated in studies of the fruit fly *drosophila*, how genes are inherited in groups. The number of coupled groups corresponds to the number of chromosomes in the simple set. By crossing-over, an exchange of genes may occur between corresponding coupled groups; the frequency of exchange is specific to individual species and genes. The genes are arranged on the chromosome in a linear pattern. The Morgan unit is the exchange frequency of 1%, which does not, however, correspond to the real spatial distance between the gene-loci. K.Fi.

Morphine. A psychotropic substance contained in opium and first isolated by Sertürner in 1804. Hypnotic in therapeutic doses (up

to 15 mg); acts as a narcotic analgesic in higher doses. Morphine is a strong narcotic and leads to dependence. Physiological effects (partially antagonistic to atropine): contraction of pupils, reduction in heart frequency, inhibition of respiration, increased tonus of smooth musculature (obstipation). Psychological effects: there is some doubt whether the pain threshold is raised; pain anticipation is reduced. Euphoria occurs, especially in addicts; otherwise the main features are nausea, lethargy and dysphoria. Objectively there are improvements in performance (reaction time) in subjects habituated to morphine, especially under stress.

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Morphology. Theory of the structure of organisms. Attempts have been made to establish correlations between physical structure and personality, frequently through a typology, e.g. Kretschmer and Sheldon. Factor-analytical studies of body structure have highlighted a number of factors: general head size, general body length, a trunk factor and a factor for muscular bulk. See *Body build index*; *Type*. G.K.

Mosaic test. A test in which square patterns must be produced from four to sixteen cubes with surfaces of different colors, which are sometimes divided diagonally. First developed by S. C. Kohs in 1923 under the title "Block Design Test", the mosaic test has been included as a non-linguistic intelligence item in various test batteries (e.g. Arthur Point Scale of Performance Tests). There is a high correlation with intelligence, but there is a greater complexity and plasticity loading depending on age and pattern. R.M.

Mother complex. All modes of human interest in one's mother, including those which can be satisfied, and those which are forbidden and therefore generally repressed or inhibited by other defense (q.v.) mechanisms. The term is often used only for extreme and pathological degrees of interest. It then implies disturbed relationships with other females and a reduced ability to make contact with them. W.T.

Mother fixation. A human being's love for his or her mother. It represents all his expectations of motive satisfaction. The term is sometimes confined to extreme forms of fixation which prevent the individual from establishing relations with others and breaking the tie with his (her) mother. According to Freud, mother fixation includes—in every person—*oral* (mothering, contact), *anal* (demanding services from the mother but giving something in return), and *early genital* (sexual interest in the mother) components, which are inhibited or repressed to a varying degree. People differ considerably in the qualitative composition and also in the intensity of their mother fixation. W.T.

Mother image. According to C. G. Jung, the mother image may be innate or originate from the collective unconscious, and differ from the real mother. W.T.

Mother substitute. Generally a female who takes over the function of a mother for a child or other person after a temporary or permanent loss of the real mother. W.T.

Motility. 1. A basic characteristic of all living organisms. **2.** A term used to denote the degree of facility with which an organism moves. Also used in psychodiagnostics to describe the general impression of a person. H.Ro.

Motion, apparent. A perception of movement with no adequate stimulus basis. In a typical arrangement designed to produce apparent motion an object is presented in the positions A and B successively. If the length of the interval of time is correctly chosen (0.04–0.08 sec.), the impression is created that the object has moved from A to B; this is a beta-movement (q.v.). In addition alpha- (q.v.), gamma- (q.v.), delta- (q.v.) and epsilon- (q.v.) movements are distinguished. In connection with apparent motion M. Wertheimer spoke of the *phi-phenomenon* (q.v.), i.e. of an elementary (irreducible) quality of movement perception. A number of theories concerning apparent motion have come from K. Marbe, M. Wertheimer, K. Koffka, P. F. Linke, T. Erismann, *et al.*

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W.P.

Motion, perception of. The central nervous system receives signals concerning position, weight and tensions from ends of nerves attached to muscles, sinews and joints. This information is processed, and we experience it as perception of movement. It plays a large part when we have to find our way without visual perception (e.g. in a dark room). See *Kinesthesia*.

Induced motion: the apparent movement of the moon behind the clouds, which are really moving. The clouds “induce” their movement on to the moon. Our system of perception considers the large objects to be at rest, and ascribes the movement to the smaller objects moving in any related system.

V.M.

Motion study. See *Time-and-motion study*.

Motivation. One of the hypothetical processes (see *Intervening variable*) involved in the determination of behavior in addition to the

effect of a stimulus or perceived situation, the processes of learning and certain other factors, such as abilities (q.v.). Whereas abilities primarily influence the yield or level of adaptation of a specific pattern of behavior, motivation determines its level of activation, intensity and consistency as well as general direction. Learning or acquired associations determine (for non-instinctive behavior) the concrete direction toward a given object. It is, however, clear that the effect of stimuli is not always distinctly separate from the effect of motivation. Some categories of excitation, above all those for which internal stimuli are responsible (as well as those caused by external stimuli which lead to a disagreeable condition), are often interpreted as corresponding to primary needs (homeostatic disequilibrium), while other stimuli (e.g. objects) have valences and act as motives or releasers. The state of motivation is then understood as a factor which lowers the stimulus threshold for these stimuli.

The objective phenomena which in my opinion justify consideration of the hypothetical processes of motivation, are based on the fact that behavior shows (positive or negative) preferences for the objects or situations in the environment (control), and that these objects are desired or avoided with varying degrees of intensity and perseverance.

1. *The functions of motivation.* Motivation as an energizer should explain behavior. A distinction can be made between the factors which determine the general degree of activation of the organism and its state of excitation and alertness and the question as to why an individual performs specific actions. While the first problem may be considered from the standpoint of energy sources which form the basis of vital activity in general, or from the angle of activity of the nervous system (e.g. the reticular formation), the explanation of the fact that an individual is more interested in one class of objects than another is a matter for *motivation* studies as such.

This in turn raises the problem of regulative behavior. Some authors do not wish

to attribute a controlling function to motivation; in their opinion the control of behavior is a function of the learning process. Others consider that the fundamental aspect of motivation lies in the regulative influence. This problem can be solved if two different levels of control are assumed. On the one hand, control may signify the actual path followed by behavior to reach the given target which it had already achieved before, on an earlier occasion. This concrete form of control is based on learning, except in the case of innate or instinctive behavior. However the fact that an individual who is in a state of motivation or need, sets out in search of something new and turns away from certain objects in order to dwell on others, shows that motivated behavior has a general orientation or control. In this search for a relatively large category of objects or situations we can distinguish the general control of behavior which E. C. Tolman defined as its "purposiveness", and which represents nothing other than its orientation toward a specific aim. The fact that some objects or situations, unlike others, evoke a state of reduced need, satisfaction and adaptation is explained by this fundamental and implied orientation. See *Instinct; Learning*.

A third function of motivation in relation to behavior (in addition to the roles of arousal and control) resides in the fact that it endows a range of behavior with unity and comprehensive importance. In fact it is motivation which through its orientation toward a target object means that a series of movements which vary widely from the physical angle, represent behavior in the true sense of the word, i.e. an appropriate reaction to a situation.

2. *The two poles of the process and the terminology.* The terms which relate to motivation may be divided into two groups depending on whether they relate to the internal (drive and efforts of the individual) or external (valence of the object) poles of the motivational process. The first group includes concepts such as need, tension, drive,

instinct, inclination, wishes, will, intention, plan, etc. The second group consists, e.g. of valence (challenge), value, affective value, incentive, cathexis, interest, etc.

Need (q.v.) is generally the fundamental concept of motivation, while a *motive* or *motivation* (in its subjective meaning) denotes the process which leads an individual toward a concrete objective. *Need* denotes in the first instance (objective meaning) the lack of specific elements in the environment; this objective lack becomes a physiological need in that it creates a deficiency in the organism, and a psychological demand because the state of the organism is perceived by the individual as a stress which influences behavior. In the psychological sense, however, this need does not necessarily refer to an organic state or physical deficiency; there may simply be a lack of specific forms of behavioral contact with the environment (Nuttin: "*théorie relationnelle des besoins*"), and this deficiency may originate from a readiness to communicate up to the point of self-sacrifice, or from sudden growth as well as from a deficit (A. H. Maslow, C. R. Rogers).

Viewed in terms of its purely dynamic significance, i.e. overlooking the aspect of "innate behavior" which has frequently been added since W. McDougall, the notion of instinct (q.v.) approximates closely to that of need.

3. *Theoretical concepts.* The actual nature of the basic needs and their effects on behavior has been considered in terms of various theoretical concepts. Often the change in the state of the organism is interpreted as a disturbance of energy or homeostatic equilibrium. This physiological state or stimulation is the origin of the drive (or tension) which triggers behavior (drive stimulus model) until an appropriate object (incentive) has been found; through the consumer reaction to this object, the homeostatic equilibrium of the organism is reestablished or the unpleasant, internal stimulus eliminated (e.g. hunger). The needs which are defined in the concepts of physiological

states (tissue needs) are termed *primary needs*. All the psycho-social needs and all specifically human needs are frequently termed *secondary needs*, as are those which result (through the influence of learning processes, socialization, sublimation, etc.) from primary needs.

The "psycho-hydraulic" need model (used by comparative psychologists such as Lorenz) assumes that a specific energy is formed for each kind of instinctive reaction and collected in the organism; the discharge of this energy then represents behavior reactions. This discharge normally occurs in the presence of the adequate object (releaser). If such a releaser is absent for an extended period, the discharge may occur in relation to inadequate stimuli and result in vacuum responses.

The neo-hedonic need theory considers the desire for pleasure (or, more accurately, to avoid disagreeable sensations) as the decisive dynamic basis of behavior. This theory (in which Freud's model can be recognized) approximates to the model of energy equilibrium and drive stimulus, since the restoration of equilibrium (or the elimination of the excessive offer of stimuli) objectively represents pleasure. According to this theory, motivation is based on affectivity (the experience of pleasure and its opposite or anxiety), since motivated behavior consists in the urge to achieve the object which previously gave pleasure (cf. also the principle of need reduction defined by C. L. Hull).

For other authors, the ultimate foundation of needs or motivation in general resides in the fact that every function of the organism is accompanied by a drive force which works toward the exercise of that function (functional pleasure according to K. Bühler). In this sense, A. Adler (1928) spoke of an auditory drive, a visual drive, etc. More recently, some authors (e.g. H. W. Nissen, 1950) have assumed that each organ has an autonomic motivation which causes it to perform those functions for which it is equipped, and that this is a characteristic of organic tissue. In this way, Nissen tries to

explain the cognitive requirements as a "need" of brain cell tissue. See *Drive*.

H. F. Harlow (1953), on the other hand, suggests a distinction between two types of motivation: those which have their origin in the organism (homeostatic needs) and those whose origin lies in external objects (cognitive need, or need to explore the environment). This theory overlooks the standpoint referred to above that every motivational process can be viewed either from the angle of the subject that is motivated by a drive, or from the position of the object which triggers a motivation or exercises an attraction. However, there is certainly a distinction between the reaction effort for a homeostatic need by comparison with a cognitive need.

Several authors (H. A. Murray, G. W. Allport, etc.) make a distinction under several headings between viscerogenic and psychological needs, without, however, considering the question of the innate or derived character of the latter, while E. C. Tolman explicitly adopts the view of innate social needs. Since behavior involves a relationship to environmental objects, motivation and needs, which for the psychologist are nothing other than the dynamic aspect of behavior itself, may be viewed as types of relationship with the environment to the extent that they are necessary for the perfect (psychological and physiological) functioning of the individual. On account of the complexity of the environment it can be assumed that man has fundamental needs (i.e. types of necessary relationships) at the behavioral level relating to the psycho-social world and universe, and in regard to the biosphere. According to this concept of needs (Nuttin, 1968), based on the relationship with the environment, the fundamental needs in psychology can be seen as the dynamic aspect (active intervention of the individual in the psychological and physical environment) of those types of behavioral relationships which the individual seeks to achieve or maintain, and without which his functioning is disturbed to a greater or lesser

extent, or disagreeable sensations are experienced. The dynamic nature of the relations, or the possibility and necessity of active intervention in the environment (structural and functional intervention), entail the wish or demand to achieve specific forms of relationship.

4. *Need categories and research.* As regards the question of the major categories of motivation and basic needs, several systems have been suggested which depend on the number of classification criteria adopted. The list of drives and corresponding emotions indicated in the different editions of W. McDougall's study (last edition published in 1932), shows only twenty *propensities*. Historically this list has had an important influence. At present the classifications established by H. A. Murray (1938) and E. L. Tolman (1951) have an influence on research. Murray (q.v.) distinguishes between just over ten viscerogenic and some forty psychological needs. The need to complete tasks, the need for achievement and the need for sociability in Murray's list are among those categories of needs which have provided the bases for an impressive range of studies (D. McClelland, J. Atkinson, S. Schachter, etc.). On the basis of factor analyses, R. Cattell (1950) has drawn up a list of some fifteen motivational categories (*ergs*); C. Bühler distinguishes between four groups of basic tendencies; Nuttin has prepared a classification in which the need for self-realization occurs together with the needs for contact or interaction, each of which is subdivided into three different forms of need depending on the environment in which they are manifested (the physical environment, psycho-social environment, and universe). In each of these types of environment man tries to assert himself or develop and adapt by means of a network of contacts or interactions depending on the possibilities at his disposal (cognitive, affective relationships, etc.). Among the needs on which research is concentrating at present, it is worth mentioning the need for stimulation, i.e. the harmful effect of isolation or

sensory (D. O. Hebb) and affective deprivation (R. A. Spitz), as well as certain motivational states in connection with the unknown nature of objects, curiosity (D. E. Berlyne), and the needs for information, perception (H. F. Harlow), manipulation and exploration of the environment in man and animals. Work on cognitive dissonance (q.v.) (Festinger) and balance theory (F. Heider and T. Newcomb) largely belong to the sphere of social motivation. The motivational nature of aggressivity (innate or acquired) is also a problem of immediate interest (the Lorenzian view contrasting with that of K. Lewin's school and the Yale University school); experimental studies of competition and cooperation are currently important. See *Aggression*.

In "*motivation research*", the concept of motivation has a very narrow meaning. It is used in advertising psychology (see *Marketing*) to study motivations which are generally unconscious or hidden, and which must be appealed to by advertising. We cannot examine in any detail here the many individual results achieved by research into the physiological aspect of motivation and needs. See *Drive; Need*.

5. *The development of motivation.* Starting from the fundamental needs, many concrete motivations are developed as functions of widely varying cultural and individual circumstances and under the influence of many different processes. In addition to the learning processes and conditioning, channelling and socialization which are primarily active in this development, many other processes must be mentioned, such as the conscious or unconscious mechanisms supposedly discovered by psychoanalysis (q.v.) and other theories of depth psychology (q.v.). Identification, displacement, reaction formation, sublimation, and many other factors, may help a need to be satisfied in a concrete attempt to reach a specific category of objects or situations. Repression (q.v.) may cause motivational indifference toward an object which exercises an attraction on most other

people. This link between an aspiration toward a specific object and a given need may remain dark (unconscious attraction of an object) in which case we speak of an *unconscious motivation*.

On the other hand, the cognitive processes change most human needs into concrete tasks and projects. Recognition of the possibilities of achieving an aim is the concrete form in which needs control human behavior. What is commonly referred to as the will is simply the cognitively processed motivation which the individual ego prefers to other motivations, so that "my will" is the motivation favored by the conscious ego, freely or otherwise. The driving forces of the will are identical with those of other concrete motivations.

The motives and projects which exist on the bases of the developmental processes of motives in adult humans must not be considered merely as developments of forms of infantile needs. Both infantile and adult forms of motivation are embodiments of basic needs which are dependent in their concrete form on the level of development of the psychological functions in general. It is evident that each higher stage of development is influenced by the earlier stages.

G. W. Allport's theory (1937) of the development of motivation also makes a distinction between current motives and primary motives as well as those of childhood. It stresses the functional autonomy of all drives in the sense that behavior patterns which were originally motivated by specific needs (e.g. the need to earn a living) gradually find a spontaneous drive, i.e. become functionally autonomous. This opinion is reflected in Woodworth's theory that "mechanisms become drives". It remains to be determined whether the autonomous forms of behavior can be motivated by other needs which gradually find their channel, i.e. their form of embodiment, in them.

6. *Summary* (present state of knowledge). Ideas on motivation were for a long time influenced by the fact that for several decades

the main research in this sphere was conducted either into animal behavior or the pathological behavior of man. Specifically human needs remained in the background for a long time, and more constructive aspects of human motivation were neglected for pathogenic processes. In addition, behavioral research veiled the role of motivation in the context of the behavioristic S-R model. While today, in clinical and applied psychology, the significance of the motivation process is scarcely disputed, some trends in experimental psychology (with a psychophysiological or behaviorist bias) generally doubt the relevance of these intervening variables. Frequently the behavioral functions which are probably attributable to motivation are ascribed to other factors (such as stimulation and physiological states, alertness and learning).

Recently, other schools of experimental and social psychology have made a thorough study of a wider range of motivations and moved beyond the opinion that human motivation is simply an extension of homeostatic needs. See *Drive; Humanistic psychology*.

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Motivational perception. The alteration or distortion undergone by perception because of the fact that the perceiving individual is in a state of need or emotional excitement, or the perceived object has a specific (positive or negative) value or valence for his personality. We therefore recognize that perception is a result not only of the stimulus structure and sense organs but also of the personality structure and its motivational state. Murphy formulated the theory of motivational perception in the concept of autism by which he indicated that the true image given to us by the cognitive functions of reality is distorted towards the needs and wishes of the perceiving individual (cf. M. Bleuler's "autistic thought"). Several hypothetical processes whose sequence has scarcely been studied as yet are assumed in the context of motivational perception, such as perceptual defense and projection. The new research line in this sphere has been defined as the "new look" (it began between 1945 and 1950). See *Social perception*.

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Motivation theories. Term for theories which set out to explain or describe how a motivated (causative) stimulus, leads on to a motivated (caused) response. Motivation theories therefore must be able to explain what a motivating stimulus or a motivated response is, and also what happens between stimulus and response. See *Motivation*.

R.Hä.

Motivator. The functional block in Stachowiak's "Kybiak" psychostructural model (q.v.), which associates a form of motivation with the characteristic features of a stimulus in a given situation; the motivation in turn triggers a program of action, or at least creates the peripheral conditions for a program of action which is to be developed by problem solving. H.F.

Motive. A motive is a factor which enters into arousal (activation, q.v.) and the orientation of behavior. It may designate either the object in the external world which evokes a certain tendency in the subject (an incentive), or that tendency itself. Ambition or hunger just as much as, say, nourishment, may be characterized as the motive specific to a behavior and may therefore *motivate* an action. One may speak of a "hunger motive", a "stimulus motive", or an "achievement motive" (q.v.).

Less technically, a "motive" is either the goal-object or the tendency, insofar as they are consciously, intentionally or cognitively present. In this sense, any known datum may enter into the determination or volition of an action, and hence may be designated as the motive or the "reason" for a behavior. For unconscious motives, see *Motivation*.

The influence of the motive on behavior is conceived either in terms of physical causality, or in the form of a psychological or final causation according to which the behavior

itself is viewed as a physiological reaction or a meaningful response. In the latter case, certain physical or physiological factors are not excluded as causally codetermining the behavior—but such a group of factors is not characterized as a collection of *motives*. The causal action of most physical or physiological factors is apparent as conscious or unconscious tendencies, so that it seems improper to separate the two forms of behavioral determination.

Men and animals may be confronted simultaneously with several incompatible motives (goal-objects or tendencies). In this case, a *conflict* (q.v.) arises, and the strongest tendency (or, in behaviorist terms, the S-R unit possessing at this moment the most intense excitatory potential) may be thought of as inhibiting the other possible responses. Lewin (q.v.) distinguished three forms of conflict, to which much research has been devoted: approach-approach, approach-avoidance, and avoidance-avoidance (see *Conflict*; *Frustration*).

When the motive of an action consists not only of attaining to an object but of realizing a certain *level* of performance, the term *aspiration level* (q.v.), or *expectation*, is used; again, much research has been carried out in this area. This complex of problems is connected to that of the *achievement motive* or *motivation*: some subjects are mainly motivated by the desire for success, others by the fear of failure.

Bibliography: see *Motivation*.

J. Nuttin

Motor aphasia. See *Aphasia*.

Motor paths. The motor paths conduct impulses to striped or smooth muscles and lead to body movements, intestinal peristaltic processes and bronchial and vascular contractions. They are among the efferent nerves. Examples: the *nervus glossopharyngeus* (glossopharyngeal nerve, 9th cranial nerve) leads to the pharyngeal muscles. A complicated

pattern of impulses passes through the sciatic and femoral nerve during walking. The pyramidal paths conduct impulses of the voluntary motor system and the extrapyramidal motor system is responsible for movements which are largely automatic.

G.A.

Motor skills. Three characteristics describe motor skills: (1) The term refers to limb or body movement adjusted to spatial and temporal demands. (2) Skilled motion is controlled, and *perceptual-* or *sensorimotor* skilled motion acknowledges both sensory control and the role of movement-produced cues. Vision and proprioception are most important, and a shift from external, visual control to kinesthetic control characterizes much of skills learning. (A novice's close watch on his gear-stick placements becomes the glance—if that—an expert driver gives his rapid move.) (3) Differences from other behavior are not significant in theory.

1. *Points of view.* There are basic and applied concerns (medical, sport, musical, industrial, military) outside psychology, and there is overlapping within. Developmental study finds implications in the kind and regular sequence of skills that mature with early growth, and in the causes of loss (often sensory or cognitive) in old age. Human engineering features machine-skill problems involving time, man, and equipment. Time-and-motion is a familiar though unrepresentative field example; the problems now are to fit machine-design to human beings, and to improve selection and training techniques.

Basic work is part of experimental psychology, where classes of human behavior are less important than common concepts; therefore definition is not restrictive and may emphasize *motor* or *skill*. Behavior is not exclusively verbal, perceptual, or motor. Response takes movement, and most behavior has verbal or cognitive parts. *Motor* is substantial motion. It includes balance and steadiness, as in rail-walking and aiming;

single, repeated, serial, and successively cued all-or-none acts, as in tapping one key or several keys in a pattern; positioning, as setting a volume dial; continuous action, as in driving, writing, and running. *Skilled* action is patterned, graded in extent and ordered in time, and new sequences are accurately followed. Motor (Andreas, 1960; Bilodeau & Bilodeau, 1961) or temporal-spatial (Smith, 1962; Fitts, 1964; Bahrick & Noble, 1966), however, comes second to reliance on sensorimotor interaction and pre-set response. Information-processing models and feedback study are prominent.

2. *History and methodology.* Experimental membership has meant alternate skills stress and neglect, eclectic theory, and concentration on artificial laboratory apparatus, flexible to deliberate variation, non-existent work, play, and art skills.

Functionalism's (1890–1910) generous definition of psychology allowed the first major effort, with Woodworth, Cattell, and Stetson among the contributors. The next revival was a recent product of coincident events. Selection and training in World War II needed new apparatuses, and learning theory gave them use later on. Mathematical and computer advances permitted the scientific statement of how measured response depends on known stimulus value. Machine skills turned attention and support to tool and machine use as significant human activity. Fitts (1964), a recognized leader, credits Craik as a modern pioneer in analysis.

Research into human behavior presents a task to different groups of subjects under different conditions. An item, the experimental variable, differs for the groups, and a response index is related to the item's value. Target-size might be X, 2X, 4X for groups and accuracy at centering a stylus taken—other target (course, speed) and stylus (size, weight) aspects the same for all. As skill implies proficiency and practice, its study emphasizes learning.

3. *Research.* Tracking, the usual representative of continued adjusting, involves

motion extent, pattern, choice, and speed. Discrete-trial positioning simplifies the study of adjustive motion by taking moves singly; selective learning frees pattern and choice from adjustment; work tasks, e.g. cranking, use well-learned action to measure uncomplicated effects of temporary factors such as inhibition and motivation.

(a) *Tracking.* Control and display are critical features of the operator tracking station in equipment-skills. Hand or foot controls steer stimuli on a display. *Pursuit* is holding a marker on a moving target—keeping a stylus on a dot as a disk rotates. *Compensatory* tracking is less accurate, as displays do not separate target input and feedback; an operator nulls pre-set stimulus-drift from a fixed point—a joystick returns a meter needle to zero or a dot to oscilloscope crosshairs. Responding is scored by pattern, direction, and amount of motion, time on target, time sharing, and information transmitted.

Control variables are number and kind (knob, stylus); plane, extent, direction of motion; elasticity, friction, and mass. Accurate moves need feel, but friction lowers precision and speed. *Display* programs set tracking courses by varying physical-stimulus input values: extent, direction, periodicity, frequency, rate of target motion; number of stimuli; noise. A single-dimensional, slow, regular course is most easily tracked. Displays give *information feedback* (IF), some representation of error between output (control $\times$ control system) and target input. Feedback stimulates corrective action and determines behavior, and the consequences of the many possible ways of transforming output-input error to display IF have wide extra-laboratory implication. *Control system* (order, lag) or *control-display* (magnification, nonlinear distortion) variables can be considered in IF transformation.

(i) *Analysis.* "Coordination", the lay term for skill, fails to show up in experiment. Part-skills combine by the law of independence. Man is exact at doing things together with chance frequency; i.e. if the azimuth tracking

part has 90, elevation 80 per cent time on target, the whole-task scores 72, not 80. Transfer of training and interpart and ability-test correlation are alternative approaches to analysis.

(ii) *Other areas.* Major concerns are to determine: limits to reaction latency, rate, and extent; short- and long-term effects of practice schedules—frequent rest helps tracking, but massed practice does no permanent harm; amount and direction of transfer of training—almost invariably positive—from old to new learning for practice, display, and control factors. Tracking memory is excellent.

(b) *Positioning.* Drawing a line or setting a clock exemplifies a graded control move by discrete trial presentation: setting, score (IF), break, next setting. . . . The control, often borrowed from tracking, determines reaction characteristics (rate, latency, continuity) useful to tracking theory, but IF is the main object and the usual response scores are the extent of motion and size and sign of error in control placement.

(i) *Feedback.* The effects of IF (score) displacement in time and space get slowed-down study relative to tracking. IF comes between separate tries at a stationary target, and if control and target are out of sight, score at the end of a trial is the only IF—and is easily withheld or presented as any function of the physical size of control movement. The value of a next move, change or repetition of the last move, depends on the last IF; though learning occurs only when IF is given for responding, an established response drops out if a new IF code signals error. Extreme IF distortion can slow learning or lower accuracy, but human beings take many distortions in their stride—nonlinear relation to response extent, inexact IF. Time delay is ruinous to tracking but not to discrete-trial adjustment.

(ii) *Memory.* Unlike tracking, positioning is subject to forgetting; even the spacing of practice trials has an adverse effect on accuracy. Earlier (proactive) or later (retroactive) learning aids or interferes with mem-

ory, since earlier learning has positive or negative transfer to new learning. The combination of component-analysis with memory design in discrete-trial response yields forgetting functions for motor tasks, and shows the interdependence of components of memory. Parts are IF, correct control move, and alternative moves; what is remembered of one affects memory of the others.

4. *Comment.* Motor learning (Bilodeau & Bilodeau, 1961; Adams, 1964; Noble, 1968), engineering psychology (Melton & Briggs, 1960; Fitts, 1963; Poulton, 1966), method (Bahrick & Noble, 1966) have had recent and thorough critical evaluation; Fitts (1964) covered skills as human learning—features, history, taxonomy and theory; Bilodeau edited books on skills learning for college level (1969), and above (1966). Hence there are recent surveys of status, and reference sources to methods, facts, and theory for the full range of motor tasks and for ability, feedback, memory, information handling, instruction, and developmental variables. Recent past experience indicates the need to follow up findings and new approaches to theory under an exacting standard of stimulus and response description. The majority view plays down any uniqueness of *motor* or *skill*, and favors an analytic approach and simple situations; its rightness depends on empirical testing.

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I. Bilodeau

Motor speech area (syn. *Broca's area*). Broca's area is synonymous with the motor speech area. It is the posterior part of the third or inferior frontal gyrus just in front of the lower part of the precentral gyrus. The name is usually applied only to this area of the dominant lobe. It is involved in the motor aspects of speech and lesions of it are associated with expressive aphasia. However, function cannot be too rigidly localized as lesions elsewhere can produce expressive aphasia (e.g. in the dominant parieto-temporal regions). See *Localization*. *B.B.*

Motor theory of consciousness. The theory supposes that the particular quality of consciousness is due to the motor response, or perhaps that the whole neural circuit from stimulus to response determines consciousness. Thus it follows that how an object is perceived will depend on how one reacts to it muscularly. *C.D.F.*

Motor type. A variant of the imagination types described by J. M. Charcot. This type designates a person whose imaginative life is clearly marked by motor (movement) images and additionally by particularly strong tactile imagery.

Mourning (syn. *Grief*). According to Freud, a reaction to the loss of an object or person. As an affect, mourning approximates a depressive mood; as a process, it is said to

include the repression of all individual aspects of the lost object, and of expectation of the object's presence in all situations in which it can no longer appear. Mourning diminishes to the extent that such repressions are successful. The loss has been overcome when the object is no longer involuntarily expected, and when the image (or idea and memory) of the object no longer provokes a mourning effect, or any tears.

Bibliography: Freud, S.: Mourning and melancholy. In: Collected papers, Vol. 4. London, 1924–5. *W.T.*

Mouth rearing in fish. This characteristic has developed independently in different species of fish, e.g. in labyrinth fish (*anabantidae*), cardinal fishes (*apogonidae*), *tachysuridae* and *osteoglossidae* and *cichlidae*. The mouth-rearing fish are an advanced stage of the "open-rearing" fish. In the course of phylogenesis their eggs have become larger and more obtrusive and the adhesive mechanism has regressed. In some types of fish the eggs are taken into the mouth so soon after spawning that special measures are necessary for successful fertilization, e.g. egg traps and genital brushes. Mouth rearing is not specific to one sex; the passive partner also participates and has to fast while the rearing process is under way. The free-swimming young fish are generally guided by the parent fish.

Bibliography: Heinrich, W.: Untersuchungen zum Sexualverhalten in der Gattung Tilapia (Cichlidae, Teleostei) und bei Artbastarden. *Z. tierpsychol.* 1967, *24*, 684–754. Wickler, W.: Ei-Attrappen und Maulbruten bei afrikanischen Cichliden. *Z. Tierpsychol.* 1962, *19*, 129–64. *K.Fi.*

Mouth space. Presumably the first, primitive phase of spatial awareness determined by the movements of the infant to find its mother's breast. This oral or original space is forced through into the child's awareness by feeling and movement impressions; there is as yet no connection with vision. This is a stage preceding grasping space. *M.Sa.*

Movement afterimage. Aristotle describes the following example of the afterimage: if one looks at a waterfall for some length of time and then at a motionless shore, one has the impression that the shore is moving in a direction opposite to the waterfall. This phenomenon was observed repeatedly in various forms. The system of perception has accommodated itself during the observation to the system of relations. *V.M.*

Movement formula. A plan of the sequence of movements necessary for a given action. *R.Hä.*

Movement illusion. 1. See *Motion, apparent*.
2. The illusion that one's body is moving.

Movement, stereotyped. The uniform repetition of the same movement pattern. Even people in good health frequently show a tendency to such stereotypes, e.g. with gestures of embarrassment such as "turning buttons". It occurs in various psychic illnesses, especially obsessional neuroses (q.v.) and schizophrenia (q.v.). *A.Hi.*

MPI. See *Maudsley Personality Inventory*.

Müller, Georg Elias. B. 20/7/1850 in Grimma; d. 23/12/1934 in Göttingen. Studied history and philosophy in Leipzig and Göttingen; obtained his doctorate in 1873 under Lotze in Göttingen with a thesis on "Sensory attention"; he then became a tutor in Rötha and a private lecturer in Göttingen. In 1880 he accepted a chair of philosophy in Czernowitz but returned to Göttingen as early as 1881 as H. Lotze's successor and remained there until his retirement in 1921. His pupils in Göttingen included Külpe (q.v.), Katz, Jaensch, and Rubin.

Müller was one of the founders of experimental psychology. His major contributions

were in the spheres of psychophysics, memory and visual perception.

In his monograph "On the fundamentals of psychophysics" published in 1878 and his work on "Standpoints and facts of psychophysical method" which appeared in 1903 he criticized Weber's law in detail, as well as the work of G. T. Fechner, and set out what he considered to be the fundamental psychophysical axioms of the relationship between perception and neural stimulation, which later became the bases of the gestalt-psychological principle of isomorphy. In the sphere of visual perception, Müller was particularly important for his essays on the psychophysics of visual sensations (1896-97), which contain a revision of E. Hering's theory of color perception. In 1930 he published two further monographs on the psychophysics of color sensations, which did not, however, equal the importance of his earlier works.

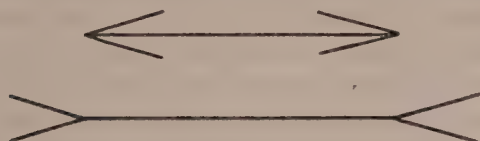
Müller's work on memory research met with the greatest interest. Together with F. Schumann (1894), A. Pilzecker (1900) and others, he continued Ebbinghaus's studies of memory and arrived at important results. He invented the *right associates procedure*, discovered associative and retroactive inhibitions and developed more effective learning methods, etc. Particular importance attaches to his three-volume monograph "On the analysis of memory activity and the process of imagination" (1911-17), in which he described his famous studies of the phenomenon of memory. Müller's studies of memory differ from those of Ebbinghaus, in particular through the addition of introspective reports by the subject to complete the objective data. He was able to show that even when nonsense syllables are learnt the process of learning is not mechanical and automatic; there is always a conscious and active organization of the learning assignment by the subject. With his opinion that association by contiguity not only makes learning possible but is complemented by conscious learning "sets", Müller was in close agreement with the research results achieved at much the

same time in the psychology of thinking by O. Külpe and the Würzburg school. See *Memory*.

Main Works: *Zur Grundlegung der Psychophysik*. Berlin, 1878. *Die Gesichtspunkte und die Tatsachen der psycho-physischen Methodik*. Strasbourg, 1903. *Experimentelle Beiträge zur Lehre vom Gedächtnis*. Leipzig, 1900.

Bibliography: Boring, E. G.: Georg Elias Müller, 1850–1934. *Amer. J. Psychol.*, 1935, 47, 344–8. Katz, D.: Georg Elias Müller. *Acta psychologica*, 1935, 1, 234–40. *W.W.*

Müller-Lyer illusion. The most widely studied of the geometric illusions. Although the two horizontal lines are equal in length, the arrow heads at their ends make this difficult to perceive. There are many theories accounting for this illusion, including those based on misplaced *constancy* resulting from seeing the illusion in *perspective*. However the illusion is also effective in the touch modality.



C.D.F.

Multi-dimensional diagnosis. The application of diagnostic methods which cover several personality dimensions in a single test, e.g. MPI, MMPI, 16 PF (see *Picture frustration test*), etc. *F.G.*

Multiple choice technique. A technique in programmed instruction (q.v.). The subject selects his answer from a repertoire made explicit in the step. Ant. *Free-choice method* (q.v.). Most “programmed” textbooks and programmes for teaching machines now use the MCT. *H.F.*

Multiple climax. A series of sexual climaxes which is known to occur during intercourse

with some women, as opposed to the single, highly localized climax which occurs in males. See *Orgasm, multiple*. *G.D.W.*

Multiple correlation. Parametric method to determine the correlation between a (criterion) variable and a combination of other variables. The level of the multiple correlation is dependent on the level of the intercorrelation of the other variables and the correlations between those variables and the criterion variable. *G.Mi.*

Multiple sclerosis. A disorder of the spinal cord and brain in which there is a patchy loss of myelin and replacement by scar tissue. The cause is unknown, although slow viruses have been implicated. Multiple focal neurological lesions occur, the illness following a course of relapses and remissions, usually over many years. Mental symptoms are frequent. Intellectual deterioration is common together with mood changes. Euphoria was thought to be the typical mood change but depression is in fact more common. *D.E.*

Münsterberg, Hugo. B. 1/6/1863 in Danzig (now Gdansk, Poland); d. 16/12/1916 in Cambridge, Mass. Münsterberg studied medicine, philosophy and psychology in Geneva, Leipzig and Heidelberg. In 1885 he received his philosophy doctorate under Wundt (q.v.) in Leipzig; in 1887 he obtained his medical doctorate in Freiburg. In 1892, at William James’s (q.v.) instigation, he was invited to Harvard, and was made director of the psychological laboratory there in 1897, in which year he was also appointed Professor of experimental psychology. He stayed at Harvard (except for one year, 1910/11, when he was exchange Professor in Berlin) until his death while lecturing.

Münsterberg’s interests showed the influence of his philosophical training as well as his natural-scientific inclination. His philosophical system (“voluntary idealism”)

aimed at a theory of value inquiring not into cause and effect but goal and norm.

At the beginning of his scientific career Münsterberg dedicated himself mainly to experimental psychology. After 1900, he turned more and more to applied psychology (q.v.) and made pioneer contributions in this field. He preferred the description "psychotechnics" (q.v.) for this area, and defined it as the science of the practical application of psychology in the service of cultural tasks. In his last major work (1914), Münsterberg saw the tasks of psychotechnics as lying mainly in the fields of business, education, law, art, health and social order. His own research interests were correspondingly wide-ranging. He was especially interested in the applications of psychology in industry and business. He developed the first vocational selection test (1910), carried out selection investigations for various professions, tried to validate vocational aptitude tests by success criteria, and wrote the first significant book in the area of industrial and occupational psychology. He was also interested in educational and clinical psychology, and was among the first to use suggestion (q.v.) and hypnosis (q.v.) in psychotherapy. In forensic psychology (q.v.), he again performed pioneer work with his articles on credibility (q.v.) and, e.g. his investigation of the connection between blood pressure changes and the truthfulness of testimony.

Main works: Psychology and life. Boston, 1899. On the witness stand. New York, 1908. Psychology and the teacher. New York, 1909. Psychotherapy, New York, 1909. Psychology and industrial efficiency. Cambridge, Mass., 1913. Psychology; general and applied. New York, 1914. *W.W.*

Murray, Henry Alexander. B. 13/5/1893 in New York. Murray studied biology and medicine, and worked as an instructor in physiology at Harvard and as a surgeon at the Presbyterian Hospital in New York. He was an assistant for two years at the Rocke-

feller Institute for Medicine in New York, doing research into embryology. He obtained degrees at Harvard and Columbia, and, in 1927, a doctorate in biochemistry at Cambridge, where he first became interested in (Jungian) psychology. In the same year he became an instructor in psychology at Harvard, even though he had no academic training in the subject. In 1928 he was appointed assistant Professor and director of the Harvard Psychological Clinic; in 1937 he was made associate Professor; in 1937 he completed his psychological formation under F. Alexander and H. Sachs. He left Harvard in 1943 to serve with the U.S. Army Medical Corps and was put in charge of an Office of Strategic Services assessment service. In 1947 he returned to Harvard and was appointed Professor of clinical psychology.

Murray's importance in psychology lies mainly in his contributions to personality diagnosis and personality (q.v.) theory. He has developed a number of different techniques, and especially projective tests (q.v.), for personality investigation, among which the Thematic Apperception Test (q.v.) is pre-eminent. Murray's theory of personality is among the most complex and detailed of the existing systems. Emphasis is placed on the individual in his whole complexity, as is evident from the Murrayian term "personology". Freudian psychoanalysis (q.v.) has had a profound influence on his work, which adopts the concepts of id (q.v.), ego (q.v.) and superego (q.v.) with only slight modifications. Murray also recognized the importance of early childhood experiences for the later development of personality, which led him to accept the psychoanalytic notions of fixations (q.v.) and complexes (q.v.) (anal, oral and castration). There is also a similarity in the importance accorded to unconscious motivation (q.v.). Murray stresses more heavily than did Freud the role of socio-cultural environmental influences and physiological processes in the development of personality. He also decries the overemphasis on individual drives or motives, such as

Freud's on sex, or the Adlerian will-to-power, and stresses the necessity of assuming the existence of a large number of needs in order to explain the dynamics of behavior. He has established (on the basis of projective data, interviews, etc.) a list of twenty-eight needs, which he believes occur in almost every individual, and whose relative degree of expression conditions the individual nature of each personality. Murray's needs are interrelated with "presses", or objects and events that are significant for the individual. See *Need*.

Main works: A method for investigating fantasies (with C. D. Morgan). *Arch. neurol. psychiat.*, 1935, 34, 289-306. Explorations in personality. New York, 1938 (with others). Assessment of men. New York, 1948 (with others). Outline of a conception of personality (with C. Kluckhohn). In: Kluckhohn, C., Murray, H. A. & Schneider, D. (Eds.): *Personality in nature, society, and culture*. New York, 1953. Preparations for the scaffold of a comprehensive system. In: Koch, S. (Ed.): *Psychology: a study of a science*, Vol. 3. New York, 1959, 7-54. Studies of stressful interpersonal disputations. *Amer. Psychologist*, 1963, 18, 28-36. *W.W.*

Muscarine. A substance with a strong, direct energizing effect on the (cholinergic) post-ganglionic, parasympathetic synapses; chemically related to acetylcholine and with comparable effects to pilocarpine and arecoline. Muscarine is an alkaloid from the fly agaric mushroom (*Amanita muscaria*). It has a sustained effect (unlike acetylcholine). Main physiological effects: increased secretion, strong reduction of blood pressure and heart frequency even in small doses. Poisoning in high doses. Smaller doses stimulate the reticular formation and produce rapid EEG waves. This activity syndrome is much stronger than with arecoline and pilocarpine. Behavioral effects in small doses vary between excitation and sedation. Higher doses have a hallucinogenic and highly stimulating effect.

Bibliography: Riehl, J. L. & Unna, K. R.: Effects of muscarine on the nervous system. In: Wortis, (Ed.): *Recent advances in biological psychiatry*. 1960, 345-62. Waser, P. G.: Chemistry and pharmacology of muscarine, muscarone and some related compounds. *Pharmacol. Rev.*, 1961, 13, 465-515. *V.J.*

Muscle relaxants. Substances which bring about a reduction in motor activity in the skeletal muscles either centrally by inhibiting the polysynaptic reflexes or peripherally by a competitive or depolarizing effect on the stimulus transmission system (acetylcholine). Central muscle relaxants include mephenesin (Tofserol) and related substances used as tranquilizers with a psychologically sedating effect. The best known peripheral muscle relaxant is curare.

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Muscle senses. See *Kinesthesia*.

Muscle tonus. State of tension of a muscle. The muscle tension is regulated by means of the A γ fibers, which originate from the reticular formation in the brain stem. Changes in tension result from alterations in the body position but may also be caused by psychological stimulation. *P.S.*

Muscular type. Designation for a physical type that is primarily characterized by muscular growth. See *Athletic type*; *Mesomorphy*. *W.Se.*

Musical alexia. See *Tone deafness*.

Musical aptitude test. See *Music, psychology of*.

Music, psychology of. Today psychology is generally defined as the study of the responses organisms make to stimuli. If we apply this definition of psychology to the field of music, we may say that, on the response side, we perceive music particularly through our auditory sense, we perform it and we react emotionally to it (just to give a few examples). Musical stimuli may include a sheet of music, an orchestra playing, a musical instrument, or a single note or melody.

This current conception of what constitutes the psychology of music is in contradistinction to the older notions proposed by many earlier psychologists such as Seashore (1938), who thought in terms of a "musical mind" and its contents. Such a dualistic position permeated the psychology of music from about 1915 to 1940.

1. *The dimensions of tone.* One of the simplest ways to study the responses to music is to take a single sound and consider its dimensions. To avoid a dualistic position of separating mental from physical events, we may consider sound as a stimulus to have two basic dimensions: the *vibrational* and the *tonal*. Among the vibrational dimensions we consider the sound wave, its frequency, intensity and characteristic wave form. On the tonal side, we may judge its pitch (high or low), loudness or timbre, along with some other possible dimensions, such as volume and density.

Of these, pitch has been the subject of most research. Pitch is directly related to the frequency of the sound wave. Low pitches tend to relate to slow frequencies and high pitches to rapid frequencies.

Numerous studies have been done on pitch discrimination: that is, how fine a discrimination can be made when two different pitches are sounded alternately. Seashore claimed that capacity for pitch discrimination, along with loudness, time, timbre, rhythm, discrimination and tonal memory, were set by heredity. However, Wyatt (1945), among others, demonstrated that students with poor pitch discriminations could be trained to

make a great improvement, if knowledge of results was imparted in the training process.

In pitch discrimination, two tones are presented and the subject is asked to tell which is higher or lower. Another related problem is the judgment of *absolute or perfect pitch*. This demands a pitch-naming response without regard to any reference tone. If an F# is played the subject must identify it as such. If one has perfect pitch he should be able to name tones presented at random with little error. Again, Seashore and many psychologists and musicians have maintained that the capacity is inherited. However, Lundin & Allen (1962) have demonstrated that when subjects are given visual knowledge of results they can be trained to name correctly any random note played within a two octave range.

The tonal dimension of loudness corresponds roughly to the vibrational dimension of intensity. However, there are certain ranges of frequency between about 2000 to 4000 cycles per second where the human ear is more sensitive; therefore loudness is also related to frequency.

Timbre is a third tonal dimension and is related to the characteristic form of the sound wave. Vibrating objects, whether strings, or columns of air, emit not only a fundamental tone but other frequencies above it called partials or overtones. Hence one can tell the difference between a violin and a trumpet (even though pitch and loudness are the same) because the trumpet emits louder overtones, and this gives it its brassy quality.

2. *Tonal combinations.* When tones are combined in various ways, we find in music what we call melody and harmony; but no random combination of tones constitutes a melody. Like single tones, melodies have certain dimensions. A first attribute is *propinquity*: that is, the succession of the notes shows a close relationship. A second dimension is *repetition*: the same note or notes are frequently repeated in the melody. A third characteristic is *finality* or cadence: the

feeling of ending expressed by a falling movement of tones or a counter sequence of tones may give the feeling of conclusion. Another aspect of finality is called *tonality*. Typically, in Western music, we resolve on the tonic or beginning note of the key in which the melody is written.

In the past, psychologists have been seriously concerned with the problems of *consonance* and *dissonance* in music. One group of theories may be called "natural law" theories. Helmholtz (1912) considered tones as consonant when they possessed the same overtones. Tones sounded together which gave a rough sensation quality because of beating or beating in the overtones were judged to be dissonant.

Stumpf (1883-90) offered an alternate theory of fusion. Two tones were judged consonant to the degree that they could fuse into single tones.

An alternate type of theory of consonance has been proposed by Lundin (1947). It could be called a cultural theory and presumes that what one judges as consonant or dissonant is a matter of cultural conditioning. Individual musicians differ sharply as to what constitutes consonant and dissonant intervals. Some people confuse consonance with affective values, or what they like or dislike. Consonance is further related to the musical context in which it occurs. Finally, intervals which were judged dissonant several hundreds of years ago, and therefore before the evolution of harmonic writing, are judged consonant today.

3. *Rhythm*. Rhythm, along with melody and harmony, is considered an essential component of music. It can act both as a stimulus and a response. As a stimulus it consists of variations in time between tones (or beats) as well as accents (greater loudness) placed on some of the tones. In responding to rhythm, we perceive it and make movements to it. To be considered rhythm, the various beats must have a degree of regularity and organization. Rhythm differs from tempo in that the former defines the patterning of the

tones whereas the latter is expressed in the rate at which the tones occur.

4. *Musical memory*. The ability to remember a series of tones or a melody seems to be one of the major components of musicianship. Research with several of our current musical aptitude tests indicates that a good musical memory and fine pitch and rhythm discrimination seem to be the best predictors of possible success in musical performance (Lundin, 1967).

5. *Affective responses to music*. There is a vast literature demonstrating that we react affectively when music is played. Both physiological measures and verbal reports attest to this fact. Depending on the kind of music played, changes in breathing, blood pressure and heart rate occur. Music that is strongly vigorous and rhythmic has a greater tendency to increase these physiological processes.

As to the verbal report about how one feels when certain kinds of music are played, Hevner (1936) has demonstrated a number of relationships. Music played in the major mode is more likely to be judged as happy, that in the minor mode as sad. High pitches are judged as sprightly while low ones seem to have sad qualities. Fast tempos tend to make happy music whereas slow ones have the opposite effect.

Farnsworth (1950) has studied extensively the matter of musical taste, what kinds of music we like or dislike. There tends to be a considerable stability in our tastes; and we tend to agree as to what we like or dislike, particularly as far as serious music is concerned. Over a period of twenty-five years, Farnsworth has surveyed expert musicologists and found they agree that Bach and Beethoven are the two most eminent composers of all time. Although there have been a few shifts in the ratings of the top ten composers over this period, the list remains virtually the same. There is also a reverence for the past, in that the majority of composers rated as great lived in the eighteenth and nineteenth centuries.

6. *Musical ability.* One of the major issues in the psychology of music has been what constitutes musical ability or talent. Seashore considered a *theory of specifics* in which he stated that musical ability consists of many different talents; he based his test of musical talents on that assumption. The person who ranks high in most all of these often unrelated talents is most likely to be the best musician.

An alternative theory, often called an *omnibus* theory, has been proposed by Mursell, who takes a more gestalt-psychological position. He claims that musical talent involves a more general ability. Although some other kinds of talents are involved, they also are interrelated and cannot be separated out.

The heredity-environment controversy (about which is the greater determiner of talent) persists. Lundin (1967) cites evidence on both sides but concludes that musical responses, like most other human responses, are learned, and that the environmental factors seem to be the more important.

Psychologists such as Drake (1957), Wing (1961) and Seashore (1939) have developed tests of musical talent with some degree of success; but their success in prediction has not approached that in other fields of aptitude measurement, such as intelligence.

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R. W. Lundin

Music therapy. This is a special method of psychotherapy (q.v.), which attempts to obtain a therapeutic effect in a patient through various kinds of music, both heard and practiced. The effect is upon the mood of the patient and also upon his physiological functions.

In the earlier stages of human development music was tried as a therapy. The elementary significance of music was employed as a magical tool to control the forces of nature, propitiate gods and demons, and conquer sickness and death. One of the oldest examples of healing by music was David playing to Saul (I. Samuel, Ch. 16, v. 23). Pythagoras, Plato and Aristotle expressly mention the prophylactic and cathartic power of music. In the Middle Ages the knowledge of the ancients about the healing power of music was not given much attention. Only with the beginning of modern times did numerous authors (Kircher, in the seventeenth century, among others) speak of new theories and methods of music therapy. Sicknesses with psychic features were cited as particularly suited for cure by music. Modern psychotherapy seeks to grasp the specific significance of music as a therapeutic agent. After the Second World War two "schools" developed independently of each other. The "American school" (Illing & Benedict, 1958) may be described as a form of "musical pharmacology" in the sense of a psychotherapeutic method. The "Swedish school" (Pontivk, 1948, 1954, 1962), whose psychotherapy is strongly depth-psychological, gives music therapy an important place, by seeking to reach deeper layers of the personality (q.v.) through the specific properties of music than is possible through the spoken word. Music therapy today can be divided into individual and group therapy.

1. *Individual music therapy* is the treatment for a shorter or longer period of an individual patient by music therapy. The treatment situation is both the therapeutic partnership of doctor and patient and the planned use of

specific musical possibilities. Methods are thus evolved which:

(a) either set in motion an analytical process (see *Psychoanalysis*), or

(b) attempt to activate the individual's creative powers, or

(c) attempt to regulate psycho-physical tension. This is done either by asking the patient simply to listen to music or actively to practice it. There are both psychological and sociological differences between the passive listening to and active practicing of music. Listening to music need not involve the manual and technical aspects of musical activity. Playing music demands the commitment of the whole personality both to get into the music and to master the necessary manual and technical skills. The music to be played and the instruments chosen for this active music therapy are simple (pentatonics, simple rhythms and tunes, rhythm instruments, xylophone, bells, etc.). Listening and playing complement each other and together form a single therapeutic system within the psychotherapeutic treatment.

2. *Group music therapy* is a form of group therapy (q.v.). Listening and playing can both contribute. They can be used to create a therapeutically effective sociodynamics within the context of certain norms of group therapy. Examples of this form of group therapy are playing together on simple instruments, combination of music and dancing, improvised dancing to classical music.

One might note in criticism that the possible results of music therapy are for the most part not specifically ascertainable. They are more likely to be attained in conjunction with other means of concentration, release and tranquilizing (hypnosis, q.v., autogenic training, q.v., looking at pictures). But this is not to dispute the practical value of a planned music therapy.

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psychischen Heilwirkung der Musik unter besonderer Berücksichtigung der Musik von J. S. Bach. Zürich, 1948. Id.: Heilen durch Musik. Zürich, 1955. Id.: Der tönende Mensch. Psychorhythmie als gehörseelische Erziehung. Zürich & Stuttgart, 1962. Schwabe, C.: Musiktherapie bei Neurosen und funktionellen Störungen. Jena, 1969. H.-N. Genius

Mutation, genetic. A lasting change in hereditary characteristics which occurs without apparent cause. Genetic mutation is the change in a hereditary unit; the old allele is either transformed or stimulated to produce a new variant of daughter allele. A distinction is made between dominant and recessive autosomal and sex-related mutations. Somatic mutation is the change in hereditary factors affecting many or all cells. I.M.D.

Mutation, psychological. Sudden change in the structure of the consciousness (J. Gebser). Speculative concept which must not be confused with genetic mutation. W.Sch.

Mutism. Dumbness even though the speech mechanism is intact. Depending on the cause, a distinction is made between congenital and hysterical or reactive mutism. Mutism is generally encountered in children (usually caused by timidity or anxiety) and often only in relation to specific persons; in schizophrenia, mutism is primarily a symptom of catatonia, and occurs not infrequently as a secondary consequence of hospitalism. W.Sch.

Mydriasis. Dilatation of the pupil. The width of the pupils is determined by the interaction of the *dilatator pupillae* (innervated by the sympathetic nervous system) and *sphincter pupillae* (innervated by the parasympathetic system) muscles which are situated in the iris and are among the internal eye muscles. Mydriasis therefore occurs, e.g. on stimulation of the sympathetic system by sympathicomimetics, or on paralysis of the parasympathetic system by parasympathicolitics. R.K.

Myelencephalon. See *Medulla oblongata*.

Myograph. A device for measuring muscular reaction.

Myokinetic test (*Mira myokinetic test*). An objective personality test based on the theoretical assumption (held, e.g. by N. J. Oseretzky and E. Kretschmer) that motor and mental processes are closely related in man. The test problems, which have to be solved blindfolded and using the right and left hands, consist in tracing and continuing preprinted lines and shapes on the horizontal and vertical planes. There are separate standards for young people and adults, and for the two sexes. The test is used, e.g. to diagnose drives, affectivity and adaptation; it has been found that different normal and clinical groups give varying results in this test as a result of characteristic syndromes.

K.D.N.

Myopia. Short-sightedness. With hyperopia and astigmatism, myopia is one of the main eye defects. Axially parallel light rays are united in front of the retina. Refractive myopia: the incident light rays are refracted by an excessive amount. Axial myopia: the *bulbus* is too long, generally for innate reasons. A distinction is made between: (1) *benign myopia*: this form becomes stationary with puberty; (2) *progressive malignant myopia*, which leads to changes in the area of the *fundus* (see *Retina*). It is probably caused by a pathological increase in the extensibility of the *bulbus*.

R.R.

Mysticism. An attitude by which the mind (spirit) enters into direct, immediate and inward communion with a sacred principle inaccessible to the senses and to reason. In religions, mysticism is displayed in the orientation of one's whole being (emotions, will and intelligence) toward transcendence

of the narrow confines of profane existence, which striving culminates in the illumination of ecstasy; various practices (prayer, purification and asceticism, q.v.) are used to induce this state. See *Meditation*.

A.T.

Myth (syn. *Mythos*). A story or implied account of the characteristics of nature, or of beings with suprahuman powers and qualities, the commerce of gods with men, and the fate of gods. In contradistinction to a fairy tale, a myth is taken as true by its narrators and hearers, and formulates the world view or conception of history of a community or society, even though—in rational and causally explicative terms—it seems improbable and nonsensical.

The basic heuristic problem of research into myths is that the “experienced” and “living” myth requires and allows of no interpretation. According to W. F. Otto, the “genuine” myth cannot be interpreted in terms of, and by, a form of existence that, by recourse to a scientific approach, has lost the faculty of the mythic. Nevertheless, it is a task of science to attempt to apprehend those aspects of myth which are still “operative”.

Cognitive aspect. Myth provides a closed picture of the world which, in contrast to the scientific world view, recognizes no open questions, and therefore embodies one stage in the historical development of thought. It might be said that whenever a scientific theory is put to social, political or therapeutic ends, it necessarily includes mythic elements; in the field of psychology, this is certainly true of psychoanalysis (q.v.). Here the cognitive coincides with the *functional* aspect: it offers a specific group of men supposedly universally valid and exemplary models of behavior (both that which is to be done, and that which is not to be done—by portraying the punishment attendant upon a particular misdeed or crime). Mythic behavioral models have also retained their value for “depth-psychological” theories (see *Depth psychology*); this is true especially of the unusually rich mythology of the

Greeks (see *Oedipus complex*; *Electra complex*). Because it has neglected the results of historical and ethnographic myth research, psychological myth interpretation is still inadequate—the major methodological error is the uncritical assumption of an analogy between myth and dream (q.v.). Similarly, there is no justification for attempts to equate mythic structures with corresponding features of the “collective unconscious” (q.v.), since they neglect the socio-cultural functions of myth.

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W.Sch.

Myxedema. See *Cretinism*.

N

n-achievement (syn. *Achievement need*). One of H. A. Murray's list of psychological needs. Refers to the need to be successful in competitive and creative enterprises. The concept of *achievement motivation* (q.v.) came into widespread popularity with the work of McClelland *et al.* (1953), who employed a projective measure of this need based on the Thematic Apperception Test (q.v.). See *Need*.

Bibliography: McClelland, D. C., Atkinson, J. W., Clark, R. A. & Lowell, E. L.: *The achievement motive*. New York, 1953. Murray, H. A.: *Explorations in personality*. Oxford, 1938. *G.D.W.*

n-affiliation (syn. *Affiliative need*; *Affiliation need*; *Need for affiliation*). The need for friendly interaction with other people, companionship, love, joining groups, etc. Included in H. A. Murray's list of psychological needs. See *Need*. *G.D.W.*

Nagel's tests. A method of testing for defective color vision, in particular dichromatopsia (q.v.). The subject is required to select those of sixteen charts which contain red, green and grey dots. Not to be confused with *Nagel's anomaloscope*: an instrument which uses spectral color lights to test color vision. *W.P.*

Nail-biting. See *Onychophagy*.

Nancy school. One of the "schools" of hypnosis research in France at the end of the nineteenth century. The leading representatives were A. A. Liébeault (1823–1904) and H. Bernheim (1837–1919) worked. The "psychic" one-sidedness of the Nancy school proved as inadequate as the "physiological" pseudo-precision of the Paris school (q.v.) under J. M. Charcot. *H.-N.G.*

Nanism (syn. *Dwarfism*). See *Pituitary dwarfism*.

Napkin ring figure. Essentially a *reversible figure* used by Wundt which can be seen with either of the circular ends facing the observer. However Wittmann claimed that there are sixty different possible interpretations of the figure. *C.D.F.*

Narcissism (syn. *Narcism*) is the characteristic of a person who places unduly high value on his own deeds and physical attributes. It is not a sexual perversion (see *Perversion*), since it is not associated with sexual gratification, and hence is to be distinguished from masturbation (q.v.) or other forms of auto-eroticism. The term derives from the Greek legend of Narcissus who, spurning Echo, fell in love with his own reflection and became a

waterside flower perpetually admiring himself.

Freud hypothesized that the ego takes another individual as love object but may, even in normal development, take itself as love object for a time. Full-blown narcissism is only an exaggeration of the normal course of events, and some degree of narcissism or self-love is properly maintained throughout life. Marked narcissism is, however, said to be greater in women and is also characteristic of schizophrenia (q.v.). *A. Broadhurst*

Narcoanalysis. An inquiry into a patient's experiences under the psychological effects of hypnotics (q.v.) (reduced attention, reduced anxiety, increased contact and communication, diminution of psychotic manifestations). The truthfulness and the amount of information acquired under narcoanalysis depend on many factors which are difficult to control. See *Truth drug*.

Bibliography: Kranz, H.: *Die Narkoanalyse*. Tübingen, 1950. *E.L.*

Narcolepsy. Characterized by periodic attacks, usually lasting minutes rather than hours, of a state resembling sleep, from which the patient may be aroused with or without difficulty. Some narcoleptics are fully conscious although unable to move a muscle. Catalepsy may occur also but is not essential to the diagnosis. Head injury and encephalitis are recognized antecedents; coexisting epilepsy is uncommon. *J.P.*

Narcosis. A pharmacologically produced, reversible loss of consciousness, in which pain and defensive reactions are absent; generally used for surgery. The effective mechanism seems to be associated with cells, but the brain cells are apparently more sensitive than others. Narcosis runs through various stages such as analgesia (absence of pain), excitation (disinhibition of the lower motor

centers), tolerance (deep narcosis), and asphyxia, and can be induced by different methods. Narcosis has been used for research into consolidation in studies of animal memory (nitrous oxide narcosis directly after learning leads to a loss of retention, whereas later narcosis improves retention). In humans, narcosis has been used, e.g. to study variations in daily physiological rhythm. *E.D. & E.L.*

Narcotics. Substances of various chemical and physical composition which produce a state similar to sleep with central pain elimination. Desirable characteristics: broad therapeutic spectrum, rapid action, intensity, long-lasting effect, no respiratory depression, no influence on the cardiovascular system, no other secondary effects or aftereffects (e.g. sickness, vomiting), good toleration. None of the narcotics known today combines all these characteristics. *Inhalation narcotics* (ether, chloroform, nitrous oxide, cyclopropane), *intravenous* or *rectal narcotics* (see *Barbiturates*) are used. The distinction between narcotics and hypnotics (q.v.) is quantitative: hypnotics with a directly soporific action do produce narcosis if they are administered in suitably high doses—unlike tranquilizers (q.v.) and neuroleptics (q.v.), which do not act as narcotics but merely intensify narcosis. Narcotics have attracted psychological interest because of the post-narcotic impairment of performance (e.g. ability to drive), which may last for up to twenty-four hours.

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Nationalism. In social psychology (q.v.), nationalism is an attitude (q.v.) characterized by an extremely positive valuation of one's own nation. "Patriotism", "national spirit", etc., are points on an attitude continuum on

which nationalism occupies an extreme position. The acquisition of a national or nationalistic attitude can occur relatively early on in the socialization process, and is similar in form to that of a prejudice (q.v.) (e.g. the development of positive reactions to symbols representative of one's own group, and the rejection of alien groups). Some research into prejudice (e.g. that of G. W. Allport) has suggested that nationalism forms the basis of further prejudices, such as anti-Semitism (q.v.) and racism. See *Authoritarian personality*; *Stereotype*. H.D.S.

Nativism. The belief that human behavior and particularly human perceptual mechanisms are inborn and determined by genetics, as opposed to the belief that they are the result of learning and experience. C.D.F.

Natural reflex. If a skeletal muscle is slightly stretched, e.g. by a tap on its tendon, a reflex mechanism is set in motion which causes the particular muscle to twitch. In contrast to an extraneous reflex, which is also an anatomical reaction of the organism to environmental changes, in the case of the "natural" reflex, the beginning and the end of the reflex arc (which in general includes the sensor, afferent pathway, reflex center, efferent pathway and effector) are located anatomically in the same place. The reflex arc is composed of contractile expansion receptors, sensitive nerve fibers, anterior horn cells in the spinal cord, motor nerve fibers, and diagonal skeletal muscle fibers. Its biological function is to adapt muscular contraction anatomically to the load. In medicine, it is used to study the function of the spinal cord. Most frequently the reflexes of the patellar tendons, the Achilles tendons, and the tendons of the biceps are investigated. E.D.

Natural retinal light. Receptors respond to perceptible stimuli by excitation. To a very small degree, such excitations in the receptors also occur constantly as physiological

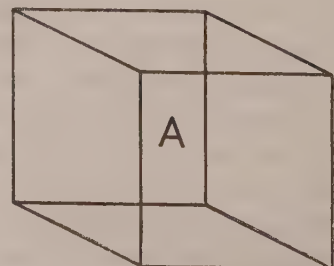
"spontaneous discharges", without any stimulus. Hence there is an impression of light—the "natural" light of the retina (q.v.), which becomes visible, especially in absolute darkness. R.R.

Natural-science psychology (syn. *Natural-scientific psychology*). Any psychology which is aware of its empirical foundation, and is thus distinguished from armchair psychology (q.v.). In a narrower sense, natural-science psychology is roughly equivalent to experimental psychology. See *Behaviorism*; *General psychology*; *History of psychology*. R.Hä.

Near point. The point in front of the eye which can still be clearly reproduced on the retina with maximum accommodation. At the age of ten, this point is situated about 8 cm in front of the corneal apex (50 cm at fifty, and 100 cm at seventy): i.e. it constantly retreats. This movement of the near point is caused by decreasing elasticity of the lens, reduces the range of accommodation and is known as *presbyopia* (q.v.). K.H.P.

Near space (Ger. *Nahraum*). Oral, visual and grasping space are at first independent but are fused by coordination of visual and oral schemata into "near space"; with the onset of locomotion, near space develops into "distance space" (eighth to twelfth months). M.Sa.

Necker cube. A reversible figure. The two-dimensional representation of a cube is ambiguous, and can be seen with corner A either at the front or at the back of the cube. These two percepts spontaneously alternate as the figure is fixated. C.D.F.



Necking, like dating (q.v.) and petting, (q.v.) forms part of heterosexual relationships. Necking generally denotes kissing, embracing and physical contact with the neck and head.

J.F.

Necrophilia (syn. *Necrophilism*). Sexual acts on or with the dead body of a person or parts of it: a very rare sexually deviant and pathological (in the clinical sense) behavior. Occurs in women as well as men. Among the genuine perversions, necrophilia is most closely related to fetishism (q.v.), both externally and in the "inner attitude" of the necrophile. An appreciable number of necrophiles are mentally subnormal or of low IQ. Forty-seven cases had been described in the literature by 1962.

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Giese, H.: *Psychopathologie der Sexualität*. Stuttgart, 1962.

H.M.

Need. "Need" is one of several English words (drive, motive, want, urge, wish, desire, and so on)—each in some respects unsuitable—used by psychologists today to designate an internally or externally aroused, brain-located force (often coupled with an accelerating emotion), subjectively experienced as an impulsion or felt necessity (a mild or intense urge) to act (immediately or later) so as to produce a certain specifiable terminal effect which is ordinarily expected to prove beneficial to the actor, and/or positively hedonic (less painful, more pleasurable) relative to the arousing situation. Herein implicitly ascribed to this variously named force (*need* in this article) are two indispensable, motivational properties, or powers: (a) the power to mobilize and select cognitive representors (image sequences) of an inviting, want-satisfying aim for action (including wish-fulfilling fantasies and long-range plans); and then (b), if strong enough relative to competing needs, the power to energize (initiate and sustain) the imaginably directed actional processes until if possible, by some

motor, verbal, or mental skill or tactic, the aim has been sufficiently achieved. The successful exercise of the second of these two powers (resulting in an actualized need) depends on numerous facilitating states and processes (for instance, enough health, knowledge, competence, confidence, volition, and so on).

This definition must be expanded and amended to some extent to take account of such special conditions as: (a) need for sleep; (b) riddance and avoidance needs (e.g. keeping out of danger); (c) intellectual needs with their invisible maneuvers (e.g. composing an essay); (d) needs to learn or to perfect a skill; (e) needs to please or benefit another person; and much else besides.

Sponsored chiefly by Lewin, the word "need" was introduced into academic psychology in the early nineteen-thirties to stand for a central motivating variable: a specific desire, say, which releases energy, imparts value to certain objects, and generates a force that has both direction and magnitude. Lewin's "need" bears some resemblance to the drive (q.v.) construct as launched a little earlier by American animal psychologists, but it is very different from the referent of this term, as set forth by Hull, for instance. According to this theorist, the ultimate basis of animal motivation consists of a number of needs, or need states, each of which is a (potentially harmful) condition (for instance, pain, full bladder, deficiency of food, and so on) requiring some action to be taken (this being one dictionary definition of "need"). In Hull's language, the required action is energized by a need-produced *drive*, rather than by a *need* as we have been saying (another dictionary definition being an impulsion to act as required by some condition). In ordering varieties of human behavior, the concept of need eventually proved a quite acceptable replacement for McDougall's once-reigning but by then banished notion of instinct (q.v.). Unlike instinct, an innate need was not said to have a repertoire of inherited, unlearned action patterns, and

though it was undeniably goal-oriented, this kind of teleology became scientifically respectable in the nineteen-fifties with the discovery of feedback systems (q.v.).

It is mainly in terms of the cognitive component, the aim, that four or five dozen species of needs can be most distinctly identified and systematically classified. It should be kept in mind, however, that it is the affective component (the desire for the actualization of the given aim) that moves the person. The potency of an aroused need can be roughly estimated in terms of the number and variety, intensity and duration of its observed and reported manifestations and effects. Of the many, standardized, semi-dependable, paper-and-pencil measures of need strength, none is more significant than McClelland's method of scoring the effects of the achievement need on the style and content of a subject's story compositions.

Madsen has provided an ample survey of the uses of need and drive. (See *Drive*.)

Bibliography: Hull, C. G.: Principles of behavior. New York, 1943. Lewin, K.: A dynamic theory of personality. New York, 1935. Madsen, K. B.: Theories of motivation. Copenhagen-Kent, Ohio, 1968. McClelland, D. C., *et al.*: The achievement motive. New York, 1953. McDougall, W.: The energies of men. London, 1932. Murray, H. A.: Explorations in personality. New York, 1938. *H. A. Murray*

Need-drive-incentive pattern. The concept derives from W. Stern. If a specific need (q.v.) encounters an obstacle to its gratification, it is not extinguished by this deprivation, but its inherent dynamic drive must seek for some outlet or detour to accord with the basic impulse. Usually the closest approximation to the previous specific, now thwarted, form is chosen. This target is an *incentive*.

Bibliography: Stern, W.: Allgemeine Psychologie auf personalistischer Grundlage. The Hague, 1935; ²1950. (Character and personality. London, 1938.) *R.Hä.*

Need gratification. An action which resolves or reduces the tension caused by a need (q.v.).

Neencephalon. The "new brain" or "harmonious prolongation" lying above the "old brain" or paleencephalon (q.v.). A fairly pure neencephalic area of the brain is the six-layer cerebral cortex (isocortex) in mammals. In the newly-born the medullated nerve fibers between cortex and brainstem are still immature, so that the child is visually and acoustically inactive. Voluntary motor behavior becomes possible as soon as the pyramidal tracts mature. The rate of medullary maturation increases with the phylogenetic age of a system. Under narcosis or the influence of alcohol the neencephalic systems are the first to cease to operate and the paleencephalic systems are inhibited. *K.Fi.*

Negative induction (syn. *External inhibition*). In Pavlovian theory: the suppression of a conditioned response by the simultaneous effect of an unconditioned stimulus, which evokes another response. Considered to be a form of unconditioned inhibition. *L.B.*

Negative practice. Emphasizing the practice of errors in order to acquire accurate performance.

Negativism. *Active.* Performance of the opposite motor behavior to that expected from the situation or stimulus. Found in catatonia, dementia and subnormality, and called active or command negativism. It presumes that the patient understands at some level the stimulus situation.

Passive. Non-performance of any behavior that would be expected in the stimulus situation. It does not presume understanding on the part of the patient. It includes active muscular opposition to attempts to induce movement, e.g. of a limb. Bleuler used the term *inner negativism* for the behavior of patients who did not obey physiological urges such as elimination and eating. *B.B.*

Neobehaviorism. A type of behaviorism (q.v.) which (in contrast to Watsonian theory) is not restricted to objective (observable) variables and their direct relationships. Neobehaviorism uses such terms as "drive", "intelligence", "expectation", "failure", etc., which are taken from the psychology of consciousness (q.v.), and allows of the introduction of hypothetical constructs (intervening variables) to explain a relationship when there are no observable links between variables. *R.Hä.*

Neologism. A new word created by an individual who attaches a meaning to it. Normal people, writers and children create new words. Neologisms are produced by schizophrenic and brain-damaged people to label known, private and bygone concepts and experiences. New sound combinations without apparent meaning produced by brain-damaged people are not neologisms but are examples of *jargon aphasia*. Known words, or phrases of known words, to which people attach new meanings have been called neologisms, but these are better denoted by the term *paraphrasia* (q.v.). *B.B.*

Neophasia. A special form of schizophrenic language. See *Neologism*; *Schizophrenia*.

Neopositivism. The Vienna Circle, which formed around M. Schlick, included the psychologist O. Neurath. This school held that only those statements which were verifiable or falsifiable under stringent experimental conditions were scientific. In psychology this signifies the reduction of all mental activity to those factors which can be observed externally as action or change of place, and the elimination of all "mentalism". Neopositivism was from the outset allied to P. W. Bridgman's operationalism (q.v.), and became influential mainly in the USA, where behaviorism (q.v.) flourished around

1930. The most extreme representatives of this school can still be found in the USA (J. R. Kantor). See *Logical positivism*. *P.M.*

Neopsychoanalysis. A term first introduced in German to designate Schultz-Hencke's school of depth psychology (1951). This representative of psychoanalysis (q.v.) tried to synthesize the different branches of analysis by seeking to explain neuroses by the dynamic interaction of drives and inhibitions. The term has also been used to indicate various schools which, starting from psychoanalysis, arrived at deviant or additional concepts: e.g. the direction taken by the psychoanalysts who emigrated to the United States and took account of cultural and social phenomena in regard to the etiology and symptomatology of neuroses, and emphasized intersubjective relations (H. S. Sullivan, K. Horney, S. Rado, and F. Alexander). Some of the neopsychoanalytic schools attempt to establish a relationship between the structure of neuroses and the social structure (e.g. A. Mitscherlich, E. Fromm and H. Marcuse). See *Neurosis*; *Depth psychology*.

Bibliography: Mitscherlich, A.: *Society without the father*. London, 1969. Schultz-Hencke, H.: *Lehrbuch der analytischen Psychotherapie*. Stuttgart, 1951.

J.L.I.

Neostigmine (syn. *Prostigmine* = neostigmine methylsulfate). A parasympathetic stimulant which acts by inhibiting cholinesterase (it blocks AChE) and by directly potentiating the action of acetylcholine. Neostigmine is more effective than physostigmine (q.v.).

Bibliography: See *Cholinesterase inhibitors*. *W.J.*

Nernst-Lillie theory of excitation. Since L. Hermann (1899), J. Bernstein (1902) and E. Overton (1902), ion-concentration differences between the excitable substrate (nerve) and the immediate environment (intercellular fluid) had been considered important in the

process of excitation. In 1908, W. Nernst developed a theory of excitation from the earlier studies; he described the propagation of excitation mathematically in terms of a telegraphic model. Between 1917 and 1936, R. S. Lillie conducted experiments with a nerve model of iron wire in highly concentrated nitric acid (specific gravity, 1.24) having many analogies with the nerve. Today this theory is only of historical interest since the process of nervous excitation is best explained by the "ion theory" developed by A. L. Hodgkin and A. F. Huxley, who were awarded the Nobel prize for their work in 1963. See *Axon; Nervous system*. K.-H.P.

Nerve. The (peripheral) nerves consist of nerve fibers (neurons) outside the central nervous system which are characteristically arranged in bundles. Nerves contain neurites (q.v.). Each neurite conducts impulses in one direction. G.A.

Nervousness. 1. A popular designation for over-excitability (of the autonomic nervous system, q.v.). 2. Factor used by Guilford & Zimmerman in personality inventories, and opposed to calmness and composure. K.P.

Nervous system (syn. *Nerve system*). The origin, conduction and transmission of excitation. 1. *Components.* The nerve cells (neuron(s), q.v.) are functional units serving the process of excitation in living beings which have reached a relatively high level of development. In contrast to previous theories that protoplasmic connections combine all nerve cells in a unit without cell boundaries (syncytium) (plasmatic continuity), or that all neurons are combined by fibrillar continuity, the nerve cell is now considered as a component which is independent both in its substance and function. It is responsible for (a) the origin of excitation: the conversion of stimuli into nervous excitation processes by sense cells (= receptor cells) which may be

thought of as specialized nerve cells; (b) conducting excitation on the basis of a special fault-proof principle by which impulses can be transmitted without change, even over considerable distances; (c) the transmission of impulses to other nerve or effector cells by means of special mechanisms. All these excitation processes do, however, follow a universally valid principle.

The basic function of the neuron consists of the reception, processing and transmission of information. A functional division of the nerve cells characterized by complex branching into an input region (dendritic zone), pericaryon (nutritive zone) and output region (neurite and axon: telodendria) is to be preferred to other classificatory theories (e.g. a division into unipolar, bipolar and multipolar nerve cells on the basis of the number of cell continuations).

The search for specific fine differentiations between nerve cells which might be responsible for the excitation process proved unsuccessful—the neuron contains the same subcellular structures as cells with other functions. Even the tigroid substance (Nissl substance) is not a special feature of the nerve cell but a multi-ribosomic endoplasmatic reticulum ("granular form") which is found in all cells with an active protein metabolism. Special differences are provided solely by the neurofibrils, small thread-like structures, which are situated in the entire cytoplasm and whose existence has repeatedly been called in question since they were first described. They are, however, immaterial as far as the mechanisms of excitation are concerned, since the latter are dependent solely on functional units of the cell membrane.

Like all cell membranes, the membrane of nerve cells consists of two lipid layers embedded between an outer and inner protein layer ("unit membrane"). Certain substances are diffused in it with varying degrees of rapidity. The ability of the membrane to ensure active conduction is particularly important for nervous excitation: certain substances are transported against an

existing concentration gradient, i.e. sodium ions are displaced from the cell to the exterior, where they are already present in a neutral state in a concentration which is ten times higher; and potassium ions are displaced toward the interior of the cell, where the concentration is some two hundred times higher than outside (the sodium-potassium ion "pump").

2. *Nervous excitation.* The fact that the nerve cell has a negative internal electrical charge in the resting state (resting potential approximately -60 mV in relation to the exterior) was tentatively explained in 1902 by J. Bernstein, who assumed the existence of a membrane with selective permeability to K^+ and Cl^- in the resting state (polarization) which changed its permeability characteristics on excitation. This ion theory of excitation, as extended by Hodgkin and Huxley, is still valid today: the resting potential (= membrane potential) can be estimated from the diffusion movements of K and Cl caused by concentration differences. In the state of excitation, on the other hand, there is increased permeability to Na^+ , which (as a result of the concentration difference and potential difference) flows into the interior of the cell and brings about a reduction in resting potential (= depolarization). The resulting concentration displacements are compensated once more by the sodium-potassium "pump". This is the process of "excitation" or stimulation, as a set of electro-chemical events.

(a) *Origins of excitation.* Various influences (mechanical, electrical, chemical, etc.) may act as stimuli on the cell membrane. The greater their energy, the greater the change in Na permeability. If the Na input remains below a critical threshold value, there is a continuously variable depolarization of the cell membrane as a function of the stimulus intensity. This is the case if excitation is generated at the receptor, when depolarization (= generator potential) increases as the stimulus intensity rises. In the case of the receptors studied in detail to date; the

generator potential is an (approximately) logarithmic function of stimulus intensity.

(b) *Excitation conduction.* Above a critical depolarization value, there is a sudden increase in Na permeability of the membrane to about five hundred times its original value, when the interior of the cell is for a short time positively charged (approximately $+30$ mV), only to return with equal speed to the initial state as a result of the subsequent K outflow. This voltage peak (action potential) lasts only for about $1/2$ msec; its amplitude is always identical for a given nerve fiber (all-or-none law, q.v.). This stimulation is not confined to the point of origin but is propagated, thus activating the neighboring membrane regions.

The conduction of excitation on the output side of the cell follows the same principle: because of the rather lower threshold at the beginning of the output region (initial segment), action potentials are produced in an increasingly dense sequence, the higher the overall level of excitation of the relevant nerve cell (= depolarization level). The action potentials pass through fibers with a very thin covering at a uniform velocity of about 30–200 cm/sec (continuous conduction of excitation). "Myelinated" fibers, on the other hand, are enclosed in thicker covering cells which are interrupted so as to leave a narrow axon region bare at regular intervals (nodes of Ranvier). In these fibers action potentials jump from one node to the next (saltatory excitation) and a considerable increase in the speed of conduction up to 120 m/sec results.

(c) *Transmission of excitation.* Excitation is transmitted by the synapses: the end of the axon (q.v.) terminates in enlarged end branches (neuropodia) which are separated by an intervening space (synaptic cleft) from the sub- and post-synaptic membrane of the next cell. Chemical substances (transmitter molecules) are ready in small bubbles (synaptic vesicles) in the presynaptic membrane and are liberated by an incoming action potential; they then pass through the synaptic

cleft to the sub-synaptic membrane where they lead to permeability changes. After this change (which is dependent on the transmitter) a distinction can be made between two types: (i) excitatory synapses: the transmitter substance leads to depolarization of the membrane; a positive potential is generated, i.e. the excitatory post-synaptic potential (EPSP) which increases the level of excitation of the nerve cells; (ii) inhibitory synapses: in the case of the latter, the transmitter brings about a hyperpolarization of the membrane—the inhibitory post-synaptic potential (IPSP): the negativity of the cell membrane increases and the overall level of cell excitation is reduced.

The magnitude and duration of post-synaptic potentials may cause major differences. If the post-synaptic depolarization does not reach the critical threshold value for generation of an action potential (which is generally the case in the dendritic zone), the charge is propagated electrotonically. Through simultaneous excitation of several synapses, spatial summation may occur, and through a rapid succession of activations of a single synapse summation as a function of time, the individual EPSP or IPSP being superimposed.

The interaction of all the excitatory and inhibitory stimuli may be considered as the integrative function of the individual nerve cell: the given net product of the overall excitation produces an action potential sequence in the output region (initial segments) and the excitation level of the cell is coded in the interval between the individual action potentials. The latter liberate the transmitter substance again at their destination, and thus cause the excitation to be transmitted to subsequent nerve cells (or effector cells) at which the excitation information is passed on, on approximately the same principle.

Recording of the electrical phenomena accompanying nervous excitation is of primary psychological importance. Suitable methods have been developed recently to determine correlates of specific psychological

processes (e.g. perceptions) (see *Neuropsychology*). One of the major problems in psychology at present is to determine the mechanisms of information stores, i.e. the conservation of the excitation phenomenon in a permanent form which forms the basis of an actual experience or behavior (see *Engram; Memory trace*). This process of consolidation seems to be completed by means of molecular biological processes which are also responsible—and by no means accidentally—for genetic control.

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G. Guttmann

Nervous system, autonomic, parasympathetic, sympathetic, vegetative. See *Autonomic nervous system; Psychopharmacology and the ANS*.

Nervus acusticus. A frequently used, though (according to the Paris Nomenclature) anatomically incorrect, term for the eighth cranial nerve (see *Nervus statoacusticus*), and its acoustic component the *nervus cochlearis*, or *cochlear nerve*. E.D.

Nervus opticus. Part of the visual pathway. Since the retina and its connection to the cortex must be considered in evolutionary terms as part of the brain, the *nervus opticus* is also referred to as the *fasciculus opticus*, i.e. the connection between the retina and the *chiasma opticum* (optic chiasm). R.R.

Nervus statoacusticus. The statoacoustic nerve consists of the vestibular nerve and the

cochlear nerve. The former brings information from the semicircular canals and the statoliths, and the latter from the cochlea of the inner ear for further processing in the brain. See *Sense organs (the Ear)*. E.D.

Nest building. Nests are built to protect eggs or young, or to provide warmth, e.g. the nests in which rodents and primates sleep. Nest-building behavior is largely instinctive, and in regard to the breeding cycle its stimulation in vertebrates is largely dependent on increasing levels of sex hormones (testosterone, estrogen). K.Fi.

Neural. Pertaining to a nerve (q.v.).

Neuralgia. Nerve pains: paroxysmal attacks of pain in the distribution area of a sensory or mixed nerve without observable anatomical changes (unlike neuritis, q.v.); often linked with preceding unpleasant sensations (of heat or tension, itching, etc.). The commonest form is radiating facial pain (trigeminal neuralgia, *tic douloureux*). Possible causes: latent infections, colds, metabolic changes, poisoning, mechanical damage, etc. F.-C.S.

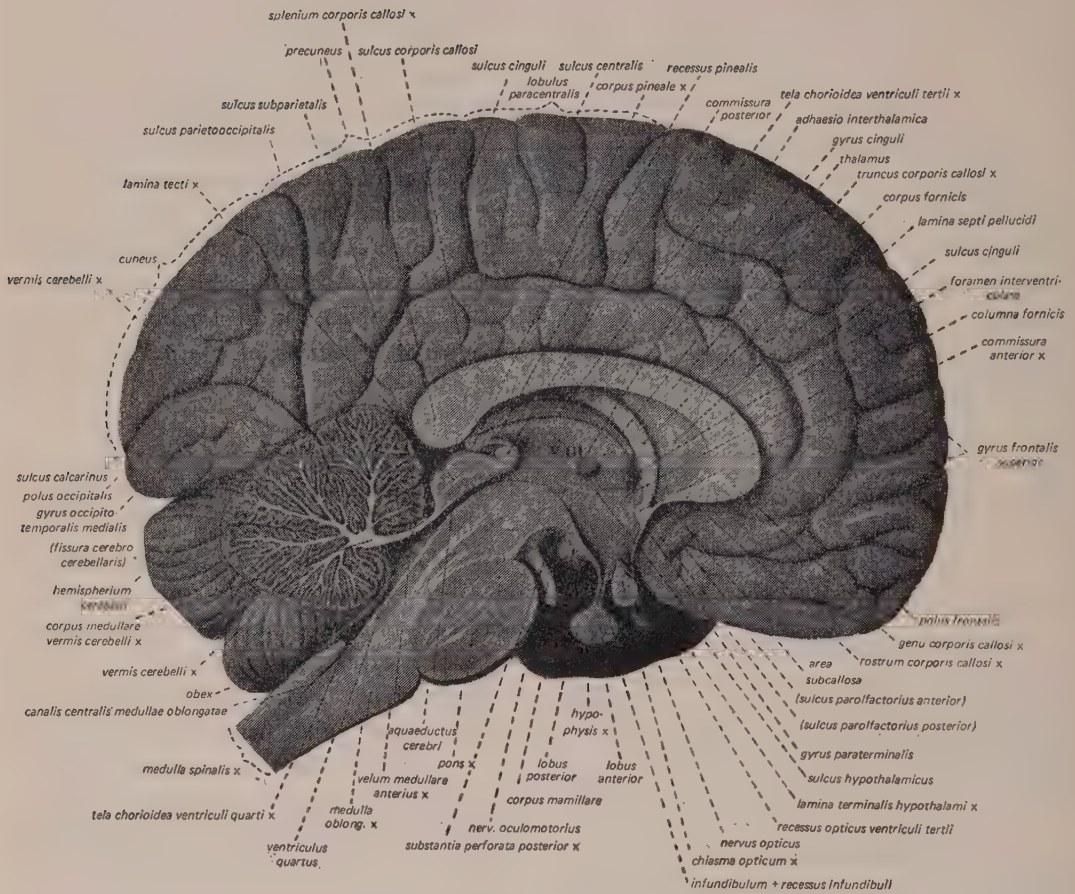
Neurasthenia. A syndrome which generally has neurotic origins, characterized by heavy fatigue, low motivation level, vegetative lability, poor concentration and general sluggishness. G.K.

Neurilemma. Nerve sheath. The peripheral axons are enclosed in lemnocytes (Schwann's cells). These may be richly or poorly myelinated, or non-myelinated. The lemnocytes contain cell nuclei and form a fine skin around the sheath, known as the neurilemma. This, together with an external reticular fibrous tissue, forms the endoneural sheath. G.A.

Neuritis. A partly inflammatory, partly degenerative condition of the peripheral nerves, accompanied by disorders of motor or sensory conduction. In contrast to neuralgia (q.v.), anatomico-pathological changes are suspected or detected. Not only subjective pain but disturbances and deficits of sensitivity and motor functions are observed. Possible causes are infections, colds, nervous lesions under pressure or strain, excessive effort, toxic action of alcohol, lead, carbon dioxide, etc. According to the number of nerves involved, a distinction is made between *mononeuritis*, *mononeuritis multiplex*, and *polyneuritis*. F.-C.S.

Neuroanatomy, or the anatomy of the nervous system, is a morphological science which investigates the structure and form of the nervous system and advances our understanding of the somato-cerebral bases of psychological phenomena.

The *nervous system* (NS) consists of a central organ and peripheral organs—the nerves which connect the central organ with the organism. The central organ consists of the spinal cord, the brainstem, the cerebellum, and the cerebrum (the most important part). Each hemisphere of the cerebrum is surmounted by a layer of grey matter, the cerebral cortex, which is subdivided by invaginations (fissures) into lobes and gyri. Below the cerebral cortex is the white matter, and at the center of the subcortical region are the caudate nucleus and the lenticular nucleus. Both hemispheres are connected by the corpus callosum; below it is a cavity containing the cerebrospinal fluid (*liquor cerebrospinalis*): this is the third ventricle, which is enclosed on both sides by the optic thalami (*thalami optici*), and below by the hypothalamus. The NS is made up of nerve tissue, which in its turn consists of neuron(s) and glia cells. The points of contact between two neurons or one neuron and the stimulus emitters or (stimulus) receptors of the organism are known as synapses. The synapses

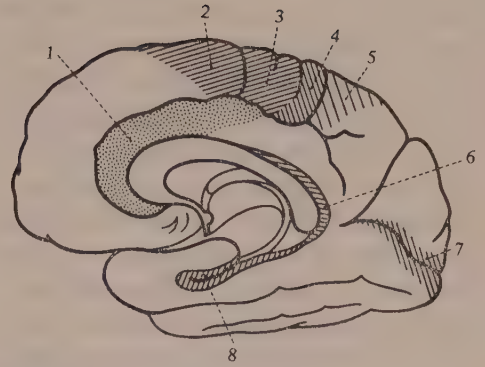
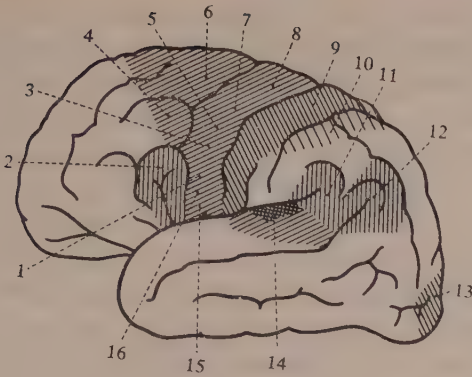


Median section through the human brain

From left to right:

1 vermis cerebelli, 2 corpus medullare vermis cerebelli, 3 hemispherium cerebelli, 4 gyrus occipitotemporalis medialis, 5 polus occipitalis, 6 sulcus calcarinus, 7 vermis cerebelli, 8 cuneus, 9 lamina tecti, 10 sulcus parietooccipitalis, 11 sulcus subparietalis, 12 precuneus, 13 splenium corporis callosi, 14 sulcus corporis callosi, 15 sulcus cinguli, 16 lobulus paracentralis, 17 sulcus centralis, 18 corpus pineale, 19 recessus pinealis, 20 commissura posterior, 21 tela chorioidea ventriculi tertii, 22 adhaesio interthalamica, 23 gyrus cinguli, 24 thalamus, 25 truncus corporis callosi, 26 corpus fornicis, 27 lamina septi pellucidi, 28 sulcus cinguli, 29 foramen interventriculare, 30 columna fornicis, 31 commissura anterior, 32 gyrus

frontalis superior, 33 polus frontalis, 34 genu corporis callosi, 35 rostrum corporis callosi, 36 area subcallosa, 37 sulcus parolfactorius anterior, 38 sulcus parolfactorius posterior, 39 gyrus paraterminalis, 40 sulcus hypothalamicus, 41 lamina terminalis hypothalami, 42 recessus opticus ventriculi tertii, 43 nervus opticus, 44 chiasma opticum, 45 infundibulum recessus infundibuli, 46 lobus anterior, 47 hypophysis, 48 lobus posterior, 49 corpus mamillare, 50 nervus oculomotorius, 51 substantia perforata posterior, 52 pons, 53 aquaeductus cerebri, 54 velum medullare anterius, 55 medulla oblongata, 56 ventriculus quartus, 57 tela chorioidea ventriculi quarti, 58 medulla spinalis, 59 canalis centralis medullae oblongatae, 60 obex.



Localization of motor, sensory and autonomic centers on the cerebral cortex

Left:

1 Motor center for tongue, 2 Motor speech center, 3 Motor center for facial muscles, 4 Motor center for head and eye movements, 5 Motor center for arm, hand, finger, 6 Motor center for trunk, 7 Motor center for shoulder, 8 Motor center for leg, 9 Somesthetic region, main field, 10 Somesthetic region, secondary field, 11 Sensory speech center, 12 Visual (optic) speech center, 13 Visual center (optical

memory center), 14 Auditory center, 15 Motor center for pharynx, 16 Motor center for larynx.

Right:

1 Autonomic region (vasomotor and secretory impulses), 2 Motor center (trunk), 3 Motor center (leg), 4 Somesthetic region, main field, 5 Somesthetic region, secondary field, 6 Olfactory center, 7 Visual center (perception center), 8 Gustatory center.

enable the neurons to join together to form conduction pathways; these are the substrate of the NS, which may be thought of as a totality of more or less complex and hierarchically ordered conduction channels: the more complex pathways dominate the less complex, thus affording the unity of action characteristic of the NS. The nervous impulses received at the periphery are transmitted by afferent nerves to the center of the particular conduction system; these impulses are processed in the centers, and then retransmitted by way of the efferent nerves to the periphery. This part of the system culminates in the effectors, which carry out the orders of the NS. The afferent and efferent sections consist of neurons connected more or less in series. The centers are neuronal complexes, which very frequently form circular connections. According to their particular degree of complexity, the conducting paths are subdivided into segmental, suprasegmental, and totalizing complexes. The totalizing center consists of two very important parts: the cerebrum (the center of which is the

cerebral cortex, whose afferent and efferent branches, the sensory and motor pathways, are extremely complex) and the cerebellum. The segmental and suprasegmental pathways form the somatic basis of reflex actions; the cerebral system is the somatic basis of reflexive and emotional behavior: the cerebellum is a control organ for global regulation of the activity of the NS. Finally, in the brainstem there is a group of neurons, known as the reticular formation (*formatio reticularis*) which controls waking and sleeping and the "diathetic rhythm", i.e. the periodic fluctuation between states such as depression and mania. A large number of animal experiments and the investigation of inappropriate reactions in brain-damaged individuals have shown that, in regard to the biological significance of the individual parts of the totalizing cerebral system, the neurobiological processes occurring in the limbic system (which is comprised in the hypothalamic system) are the somatic correlates of the relatively elementary and primitive impulses and affects of the endothymic base, i.e. of

those drives common to men and animals (e.g. hunger, thirst, the sex instinct, the various forms of aggression). In regard to cognitive functions, it is assumed that sensations have their somatic basis in the primary receptive areas of the brain; the secondary or "gnostic" areas of the brain form the cerebral basis of perception and more or less abstract perceptual complexes. The entire cerebral cortex is responsible for direct or indirect functions of judgment. The function of memory depends on the interconnections between different groups of cortical neurons and on the production of specific proteins in such fields. Finally, the "prospective" functions (formation of a plan of action and a behavioral strategy, forethought for the future, etc.) are "located" in the foremost zone of the frontal lobes (q.v.). See *Arousal; Localization of psychological functions; Neuropsychology*.

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P. Gómez Bosque

Neurodynamic substances. Chemical substances which "improve" the brain metabolism and probably lead to improved psychophysical performance. The concept of neurodynamic agents is essentially grounded in practical therapy and includes all substances which can bring about improvements in long-term impairment of physical and psychological performance. The neurophysiological effective mechanisms may be stimulation of the synthesis of biogenic amines in the central nervous system and/or increased cerebral blood circulation. The qualification "neurodynamic" is used only in connection with substances with a prolonged effect (days or weeks), unlike stimulants, which are active only for a few hours.

Vitamins and hormones are no neurodynamic. Nevertheless there is no clearly differentiated criterion. Examples of neurodynamic agents are pyriethoxine (a substance which resembles vitamin B₆—pyridoxine hydrochloride) and glutamic acid (q.v.). The effects of both substances in improving performance have not yet been demonstrated in acute and chronic tests in healthy subjects.

Bibliography: Bochnik, H.-J., *et al.*: Analysemodell für klinische Verbundforschung: Multifaktorielle Untersuchung der Pyriethoxinwirkung nach Schlafentzug bei gesunden Studenten. Fortschr. der Neurologie und Psychiatrie, 1964, 32, 399-425. See also *Glutamic acid*.
K.D.S.

Neuroendocrinology. A branch of endocrinology that studies the interaction of the endocrine glands and the nervous system. The main areas of study are (a) the influence of hormones on the nervous system; (b) the effect of nervous excitation on hormone secretion; and (c) the production and importance of hormones in the central and autonomic nervous systems. See *Hormones*.

Bibliography: Bajusz, E. (Ed.): An introduction to clinical neuroendocrinology. Basle, 1967.
W.J.

Neuroethology. Research into the neural basis of behavior with a view to establishing a synthesis of neurology and ethology. Methods used include electrical brain stimulation, derivation of action potentials from freely moving animals, elimination of areas of the brain by extirpation and coagulation, and measurement of post-operative behavioral changes.
K.Fi.

Neurogram. See *Engram*.

Neurohormones. Chemical substances which promote or inhibit the transmission and action of impulses in the central and autonomic nervous systems. The term "neurohormones" is sometimes used as a synonym

for transmitter substances (q.v.), or—more comprehensively—for all substances which play a part in the functions of nervous substrates. See *Biogenic amines*.

Bibliography: See *Hormones; Neuroendocrinology; Biogenic amines; Transmitter substances*. W.J.

Neurolepsy. A state characterized by hypnosis and the blocking of vegetative reflexes. This term is now seldom used. J.P.

Neuroleptics. Psychopharmaceutical substances which form the major group of preparations for the treatment of agitated and productive psychoses, and which are also used in severe, non-psychotic anxiety and excitation states. The term “neuroleptic” is obsolete, and it is now usual to speak of “tranquilizers”, but a subdivision into major and minor tranquilizers is necessary to establish a distinction from tranquilizers (q.v.) in the narrower sense. Chemically, the neuroleptics can be divided into rauwolfia alkaloids (q.v.), butyrophenones (q.v.), phenothiazines (q.v.), and thiaxanthene derivatives (thiothixene = Navane). As regards effect, a distinction can be made between neuroleptics and hypnotics or tranquilizers by (a) anti-psychotic effect (reduction of high-grade excitation states of a hyper- or alkinetic type, reduction of psychotic experience phenomena such as delusions and hallucinations); (b) extrapyramidal symptoms (e.g. tremor, rigor, dystonic reactions—which can be prevented by anti-Parkinsonian agents); (c) frequent strong autonomic reactions (adrenolytic, sometimes anticholinergic); (d) lowering of the cramp threshold; (e) suppression of active, non-passive avoidance behavior (q.v.) in animal experiments. When administered concurrently with tranquilizers in therapeutic doses they do not induce sleep (unlike the hypnotics), and in higher doses do not lead to narcosis (q.v.). In low doses, the neuroleptics have tranquilizing effects. Many psychological studies

have been carried out in healthy persons for chlorpromazine (q.v.), but fewer for other phenothiazines, while very few investigations have been made into reserpine (q.v.), haloperidol (q.v.), and related substances. After acute application in healthy subjects, even in low doses, neuroleptics only seldom induce motor relaxation and emotional stabilization. Impairment of performance and reduction in experienced activity are frequent. As in the case of tranquilizers, improvements are more likely to occur in cases of affective and motor stress (habitual or situative) and low psychological strain (see *Differential psychopharmacology*). The postulation of a lower degree of impairment of cognitive functions by neuroleptics than by hypnotics and tranquilizers has not been confirmed.

Bibliography: Brill, H. (Ed.): *Neuro-Psychopharmacology Symposia II*. Washington, 1967, 87–156. Efron, D. H. (Ed.): *Psychopharmacology 1957–1967*. Washington, 1968, 1044–181. See also *Butyrophenones; Phenothiazine; Rauwolfia alkaloids*. G.D.

Neurology. That branch of medicine which deals with the clinical and pathological aspects of the structure and function of the central and peripheral nervous system. D.E.

Neuron(e). The smallest functional unit of the nervous system (q.v.). Also known as a ganglionic cell in the brain. The neuron consists of the nerve cell body with the cell nucleus, the short dendrites (q.v.), and a generally very long axon(e). E.D.

Neuropathy. A term used variously: sometimes as a general term for nervous disorders, and sometimes (in a narrower sense) for an innate inclination to pathological over-excitability of the nervous system, manifested most frequently in vegetative and endocrinal disorders. The term is practically synonymous with vegetative dystonia and often indistinguishable from psychopathy (q.v.). K.H.P.

Neuropharmacology. A branch of pharmacology which studies changes in nervous mechanisms under the influence of drugs, in particular psychopharmaceutical substances. See *Psychopharmacology*. W.J.

Neuroplegics. Syn. *Neuroleptics* (q.v.).

Neuropsychiatry. The field of diagnostic and methodological problems of psychiatry in the area of the neurophysiology of brain functions. There are also close relations with neurosurgery (q.v.), experimental comparative psychology, and neurophysiology.

Bibliography: Luria, A. R.: Human brain and psychological process. New York & London, 1966. M.Ad.

Neuropsychology. The investigation of the correlation between experience (or behavior) and the basic biological processes. The term "neuropsychology" stresses the dominant role of the nervous system, although other systems also must sometimes be taken into account (e.g. hormones). The study of direct psychophysiological relationships (e.g. change in circulation variables under arousal, q.v., or fatigue, q.v.) is not part of the research field of neuropsychology, but belongs to the wider concept of "physiological psychology".

The abundant data on neuropsychology may be classified as follows:

1. *Elimination.* The attempt to determine biological bases of experience by eliminating the biological substrate and consequent changes in experience is the oldest method. In addition to the study of congenital malformations of the nervous system, acquired lesions (due to trauma or pathological processes), and voluntary elimination (see *Lobotomy*) by controlled destruction of cortical or subcortical neuron assemblies, or by isolating conductor paths in animal experiments, particular importance has been attached more recently to reversible function blocking, e.g. the temporary suppression of cerebral

cortical activity by appropriate chemical or mechanical stimulation (see *Brain pathology*).

2. *Stimulation.* The stimulation of functions is a method which allows more accurate localization. Controlled stimulation in the human brain has allowed detailed plotting of the sensory and motor systems (since the first experiments of the last century) by systematic stimulation of the cerebral cortex during brain operations, and by controlled stimulation in the depths of the brain (see *Stereotactic methods*). Information has also been obtained on the neuronal bases of emotional and motivational processes, and on the control of learning processes (reinforcement centers) and consciousness; this has had a lasting influence on psychological theory. See *Mind-body problem*.

3. *Activity correlate.* The most useful method is, however, the observation of activity correlates. In addition to the not directly accessible biochemical correlates of neuronal activity (e.g. the concentration of substances involved in the synaptic process of stimulation transmission), the observation of electrical phenomena accompanying nervous activity is most significant. It has been shown that the spontaneous electrical activity of the brain has no certain direct link with specific psychological processes, and that only activation level is reflected in the frequency and amplitude characteristics of brain potentials. However, sophisticated techniques have recently enabled the specific stimulation components covered by the EEG (e.g. for a simple act of perception) to be isolated from spontaneous activity, which is generally some twenty times stronger; this makes it possible to analyze the specific components. In perception processes this can be done by recording the activity consequent on a sensory stimulus, and adding the values cumulatively for a series of identical, successive stimuli. In this way, the non-specific spontaneous activity is increasingly differentiated from the repeated stimuli, while the specific excitation components—however weak they may be—appear with increasing clarity. The sensory

evoked potentials obtained in this way have a typical time sequence and spatial distribution for each sense area, and also vary characteristically with stimulus quality.

It is, of course, more difficult to observe specific stimuli which do not correspond to an externally elicited process, e.g. imagery or spontaneous actions. Nevertheless, special techniques have revealed the basic specific stimuli for some of these processes (e.g. readiness potentials before a spontaneous behavior).

One of the most important current problems concerns the neuropsychological principles of learning (q.v.): the transformation of the immediate excitation process into a resistant and permanent form (consolidation process). This transformation probably takes place in several stages, which are also biologically distinct. The information set down in an action-potential sequence is maintained as nervous excitation only for a short time—possibly circulating in closed neuronal circuits. The next step seems to consist in the activation of genetically determined synthesis chains: specific qualitative changes in substances which play an important part in such biosynthesis (ribonucleic acids) have been demonstrated in the course of active learning processes. The results relating to the biochemical transfer of learning point in the same direction: if ribonucleic acid is extracted from the brain of animals which have learnt a specific behavior pattern, and is then administered to untrained animals, the latter then learn the same behavior pattern more easily. It is still not clear whether the final phase of the consolidation process consists of a growth of the cell continuations, or of facilitation of synaptic transmission, or of other changes. It has not proved possible to elucidate the number of stages in a learning process, their duration and influenceability in neuropsychological terms. Relevant studies have, however, provided the strongest evidence to date to suggest that psychological models should be based on biological principles.

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Neuropsychopharmacology. A generic term for all scientific disciplines concerned with the neurophysiological, neurochemical and psychological effects of drugs (in particular psychopharmaceutical substances) and of natural body substances (see *Hormones*). Sometimes used as a synonym for psychopharmacology (q.v.). W.J.

Neuroses. See *Neurosis*.

Neurosis. 1. *History.* Although the word “neurosis” only came into use about 1780, when it was introduced by William Cullen, what we now understand by the term has figured among conceptions of mental illnesses since the time of the ancient Greeks. Through the ages, explanations of the causes of mental illnesses ranged from the somewhat scientific approach of the Greeks to the supernatural explanations of medieval psychiatry; only in the eighteenth century did a fresh perspective arise, when a new philosophical system which freed thought from preoccupation with the immortal soul and the mischief of evil spirits allowed mental disorder to be seen as stemming from the mortal brain. Scientific investigation in the fields of philosophy, chemistry, medicine, and especially psychiatry itself, was responsible for this changed viewpoint.

The theories of the chemist G. E. Stahl (1660–1734) on mental illness as either caused by diseases of the organs (which he termed “sympathetic” causation), or consisting of functional disease with no organic basis (“pathetic” causation), were the core of the

development of modern psychiatry. Stahl's doctrine of "animism" (q.v.) caused a rash of physiological studies designed to determine the psychogenic origins of mental disease. William Cullen (1769), spokesman for the school of "neuropathology" in Edinburgh—who had adopted the theories of "vitalism", a line of development from Stahl—tried to explain nervous disorders in terms of motion of the nerves. From that viewpoint, *neurosis* was a very appropriate name. Included under the term were a variety of otherwise inexplicable diseases such as apoplexy, palsy, dyspepsia, hypochondriasis, tetanus, epilepsy, chorea, palpitation, dyspnoea, asthma, whooping-cough, colic, cholera, diarrhea, diabetes, hysteria, and hydrophobia. Having originated in neurology, the term gained widespread psychiatric usage, but its connotation was vague and over-inclusive.

In 1778 Mesmer arrived in Paris and psychotherapy by hypnosis (q.v.) came into vogue. Using the hypnotic method, Jean Martin Charcot (1825–93) began his studies of hysteria (q.v.), the first systematic investigation of the neuroses (see Guillaumin, 1955). The interest generated by Charcot was maintained by Pierre Janet (q.v.) (1859–1947). In the process of hypnotizing his subjects, Janet discovered that the origin of some neuroses could be traced to forgotten traumatic events whose recall under hypnosis sometimes led to cure (see Galdston, 1967). In ascribing a psychic origin to the neuroses he separated them from other mental aberrations.

Throughout the eighteenth and early nineteenth centuries scores of classification systems for mental illness were put forth that often included subdivisions within the category of neurosis. Carl Westphal (1883–90) distinguished the obsessions, homosexuality and agoraphobia; Maudsley in 1879 spoke of *neurosis spasmodica* as a condition characterized by the disposition to sudden, singular and impulsive caprices of thought, feeling, and conduct; and Adolf Meyer referred to the "part reaction" in which only a portion of the

personality is altered while the patient remains reality-oriented.

2. *Freud's psychoanalysis and its derivatives.* Undoubtedly, the most popular and influential concept of the neuroses is due to Janet's contemporary, Sigmund Freud (q.v.) (1856–1939). Freud, too, had turned to hypnosis at an early stage of his career. He and Josef Breuer (1842–1925) aroused much psychiatric interest by their *Studien über Hysterie* (*Studies in Hysteria*, 1895), which described the "cathartic method" (q.v.) whereby a neurotic patient was enabled to release emotions under hypnosis (Zilboorg & Henry, 1941). Freud later noted that his patients were preoccupied with sexual material, and went on to conclude that sexual difficulties were the cause of all neurotic disorders. He soon abandoned hypnosis and replaced it with "free association" as a means of uncovering forgotten memories thought to be "repressed" in the "unconscious". In place of the earlier simple sexual theory of neurosis, he developed a much more elaborate one that postulated a succession of stages in a child's development, during each of which traumatic events could inhibit progression to the next stage. Depending on the stage of development, the type of inhibiting trauma, and the details of the situation, the child would develop a characteristic mechanism of defense (q.v.) that would decide the type of neurosis he would eventually manifest. The childhood trauma was assumed to be retained (repressed) in the adult "unconscious" as a complex to which were attached emotional forces: these found devious outlets in neurotic responses whose form was determined by the particular defense mechanism. It followed that recovery would require the repressed complex to be released into consciousness. Free association and dream analysis were the main procedures by which this was to be brought about.

Freud's pupils, Carl Jung (q.v.) (1875–1961) and Alfred Adler (q.v.) (1870–1937), formed two dissident groups within the framework of psychoanalysis (see Bromberg,

1959). Jung theorized that instinct (q.v.), or Freud's "libido" (q.v.), was developed from primeval instinctive tendencies deposited in a "racial" or "collective unconscious" that he claimed to be represented in all men's unconscious mental functioning. Individuals could be categorized by their "racial" archetypes. For Jung, a neurosis resulted when attitudes and life goals fell outside the scope of the individual's "racial" type. Adler's Individual Psychology essentially rejected Freud's libido theory. Adler attributed neurosis to conflicting feelings of inferiority and superiority which interfered with the "life plan" or goals of the individual. Believing that man strives for superiority, he regarded neurosis as a defective means of implementing the drive toward power.

Whereas such men as Ferenczi, Jones and Fenichel remained loyal to Freud's concepts, other students of psychoanalysis proposed variations, emphasizing one or another aspect of the Freudian view of the etiology of neuroses (see Munroe; Zilboorg & Henry). Otto Rank (1929), impressed with the trauma of birth, elevated it to a position of major importance in regard to neurotic anxiety, and constructed his "will therapy" on its theme. Wilhelm Stekel sought to shorten dream analysis, and encouraged patients to control their anxiety (q.v.) and do what they were afraid to do. Wilhelm Reich proposed that anxiety was a symptom of "dammed-up libido". He claimed to have discovered the "orgone", an energy unit which he regarded as essential to orgasmic potency, and asserted that orgone deficiency, caused by a sexually suppressed environment, culminated in neurotic anxiety. Karen Horney viewed neurosis as a protective device toward feelings of helplessness in a hostile world, stressed early life social conflicts rather than infantile fears, and sought to bring the neurotic toward "self-realization". To Harry Stack Sullivan, failures of communication in important relationships are the basis of neurosis. A deep patient-therapist involvement is conceived as the vehicle for change. In fact, none of the

psychoanalytic therapies has been impressively successful.

3. *Conditioning theory and behavior therapy.* In contrast to these socio-idiopathic methods of interpreting neurosis, another perspective has been evolving from the experimental laboratory in recent years.

(a) *Experimental neurosis.* About 1900 the states of emotional disturbance called emotional neuroses were first produced in Pavlov's laboratories (Pavlov, 1927). The basic method was to expose a spatially confined animal to a stimulus situation in which strong but incompatible action tendencies were simultaneously elicited: for instance, simultaneous tendencies to eat and not to eat. The animal would become intensely disturbed and would afterwards manifest the same disturbance whenever he was brought back into the experimental chamber, even though the conflict-producing stimuli were no longer present. Similar neuroses were later reported by many other experimenters, in some of which the initial disturbance was induced, not by conflict, but by painful electrical stimulation of the animal's legs (Wolpe, 1952; Smart, 1965).

Although the experimental neuroses were long thought to depend on some kind of stress-produced damage to the central nervous system, it is now quite evident that they are really learned emotional habits (Wolpe, 1952). The following are some of the reasons for this view: (i) The neurotic behavior consists of just such responses as have been evoked by the electrical stimulation (or conflict): pupillary dilation, pilo-erection, and other autonomic reactions, diffuse muscle tension, and motor responses such as vocalizing and crouching. By definition, these are conditioned anxiety responses (see *Anxiety*). (ii) The neurotic reactions are specifically evocable by stimuli that were present in the causal situation. They are at their strongest in the experimental cage, and can be intensified by a buzzer or other signal that regularly preceded the causative electrical stimulation. (iii) The neurotic responses show primary

stimulus generalization—a characteristic of learned behavior. For example, if the animals are placed in other rooms that resemble the experimental room, neurotic reactions are aroused according to the degree of resemblance.

A striking feature of the experimental neuroses is their resistance to extinction. Though the animal is never again subjected to the neurotogenic stress, the neurotic anxiety does not diminish when the animal is put back into the experimental cage on any number of later occasions and for any length of time. Also striking is the refusal of the animal to eat in the experimental cage even after a day or two of starvation. However, if in a place where the anxiety is relatively weak—for example, a room that only slightly resembles the experimental room—he will eat, and after doing so for a while become free of all manifestations of anxiety. He will then eat in a room somewhat more like the experimental room. Advancing in stages, it eventually becomes possible for the animal to eat in the experimental room and cage and thus overcome all its anxiety conditioning there. Apparently, anxiety and eating are reciprocally inhibitory: and when feeding inhibits the anxiety, there is a diminution of the anxiety habit. Conditioned inhibition is apparently formed on the basis of reciprocal inhibition (Wolpe, 1952).

(b) *Human neuroses as learned emotional habits.* In all respects in which comparisons have been made, human neuroses have shown the same attributes as those experimentally induced (Wolpe, 1967). Stimuli present at the time of onset become triggers to the neurotic anxiety responses, as happens in the experimental neuroses. For example, a lawyer's fear of public speaking was traced to an occasion in law school when a lecturer humiliated him when he was speaking before a class; and a woman's phobia for sharp objects began when, after an unwanted childbirth, she became terrified at the thought that she might harm her baby with a sharp knife with which she was cutting fruit. Generalization is a

feature of human neurotic reactions also. They are evocable by stimuli that resemble the primary conditioned stimuli. Other similarities to the animal neuroses include resistance to extinction and the occurrence of second-order conditioning.

Anxiety is usually overt in clinical neuroses. But there are many cases in which its presence is obscured because the patient complains of symptoms or disabilities that are more prominent or painful to him. Yet even these are really secondary results of the anxiety responses. The complaint may be of difficulty in work situations, lack of social success, attacks of asthma, impotence, frigidity, homosexuality, compulsive behavior, and stuttering, among others. The primary therapeutic target is still the deconditioning of anxiety. The only true exception appears to be classical hysteria with *la belle indifférence*.

(c) *Clinical derivatives of experimental methods.* The clinical methods based on experimental paradigms are called *behavior therapy* (q.v.). Counter-conditioning methods derived from the experimental therapeutic model described above have in recent years been increasingly widely adopted in the treatment of neuroses (Wolpe, 1958; 1969). Operant conditioning methods (Ayllon & Azrin, 1968; Schaefer & Martin, 1969) have also been used, but so far much less in this connection than for modifying schizophrenic behavior. The clinical counter-conditioning methods do not, as a rule, employ eating, but other responses incompatible with anxiety responses, such as anger, sexual responses, and deep muscle relaxation.

A common technique, employing muscle relaxation, is *systematic desensitization*. It consists of training the patient to relax and then having him imagine, while relaxed, the feeblest situation of a phobic theme. For example, a person with a fear of heights might at first imagine looking down from a height of ten feet. The image is given repeatedly until no more anxiety is evoked. Successively greater heights are then similarly treated, so that eventually the highest evokes

no anxiety. Scenes that no longer evoke anxiety when imagined during relaxation, also no longer do so when encountered in reality. In the minority of patients whom imagined scenes do not disturb in the first place, real stimuli must be used in the therapy.

Almost 90% of neurotic patients recover or are much improved by behavior therapy in about thirty sessions (Wolpe, 1969). The relevance of the specific procedures has been impressively supported by controlled studies (e.g. Paul, 1966). The relapses and symptom substitutions predicted by psychoanalysts have not occurred.

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Neurosis, compensation. 1. (syn. *Indemnity neurosis*.) A term for traumatic reactions to accidents, injuries, etc. A desire for indemnification in which a lack of compensation is regarded as an insult or a deprivation of rights. **2.** See *Compensation; Neurosis; Paranoia; Schizophrenia*. J.L.I.

Neurosurgery. A collective term for all operative (i.e. surgical) interventions in the brain and spinal cord and, to a small extent, the peripheral nerves. Open (after removal of the vault of the cranium) or closed methods are possible, as, e.g. in stereotactic techniques (q.v.) using only burr holes. Neurosurgery uses clinico-neurological methods for localization diagnosis, as well as radioactive isotopes, EEG, myography, X-rays, and so on. Apart from stereotactic interventions, the most important indications are injuries, brain tumors and malformations (including those of cerebral vessels). Psychology and psychiatry owe many important findings to advances in neurosurgery, e.g. recognition of the fruitlessness of a point-by-point cerebral localization of psychological functions, and the high degree of potential restoration of disturbed functions after a relatively extensive loss of brain substance. See *Frontal lobes; Lobotomy; Localization of psychological functions*.

Bibliography: Merrem, G.: Lehrbuch der Neurochirurgie. Berlin, 1968. Sargant, W. & Slater, E.: Physical methods of treatment in psychiatry. Edinburgh & London, 1963. M.A.

Neuroticism (syn. *Neurotic tendency; Emotionality; Emotional lability*). A genotypical proneness to neurosis. The second factor after extraversion in Eysenck's personality model. This general factor corresponds largely to R. B. Cattell's second-order inventory factor ("anxiety"), and relates to intensity and control of emotional responses. According to Eysenck, neuroticism is closely bound up with ANS function, especially with the duration of adrenergic (sympathetic) excitation, and is partly inherited. See *Traits*.

Bibliography: Eysenck, H. J. & Eysenck, S.: Personality structure and measurement. London, 1969. D.B.

Neutralization. Under the influence of Jung and Freud, the neutralizing of psychic energy has come to be regarded as a tendency to satisfy motives regardless of the present satisfaction afforded by them (Toman, 1960).

With progressive neutralization, motivated actions are used increasingly as a means of satisfying other motives. Neutralization of psychic energy is related to sublimation (q.v.) and motive differentiation. (See *Energy, psychic*.)

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W.T.

New York Longitudinal Study. See *Child psychology*.

Nicotine. The most important alkaloid occurring in tobacco leaves (*Nicotiana tabacum*) is related to a large number of natural and synthetic substances. In spite of the importance of nicotine as a result of the popularity of smoking, few controlled investigations have been carried out into psychological or CNS effects in *humans*. In small doses, it is said to raise briefly the level of subjective and objective activation (e.g. an increased flicker-fusion frequency). Its effects in *animals* have been widely studied, especially with a view to regulating conditioned reflexes. Small doses usually step up activity and improve the learning of avoidance reactions. Arousal is recorded in the EEG (q.v.). Larger doses impair learning ability. In both cases, however, there are contradictory findings. The difficulty of determining the effects of nicotine on behavior is possibly due to the highly complex actions in the CNS and ANS. Animal tests show that nicotine in small doses excites the cholinergic synapses in the ANS while blocking them in higher doses (depolarization). In addition, nicotine excites adrenergic systems (q.v.), releasing catecholamines (q.v.). The stimulating action of nicotine is not blocked by atropine (q.v.) but is inhibited by a series of ganglionic blocking agents. Its neurophysiological effects make it an important experimental substance in neuropsychopharmacology. Comparable cholinergic substances are described as *nicotinic* (as opposed to *muscarinic*).

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W.J.

Night blindness. See *Hemeralopia*.

Nissl bodies. Discrete granular substances occurring in the cell body of a neuron. Their high RNA content disappears with toxic or other damage, or with fatigue. Nissl bodies penetrate into the dendrites but neurite ends are free of them. They are believed to play an important part in excitation and to contribute to cellular metabolism. They can be rendered visible by staining with toluidine blue/gallocyanine.

E.D.

Nitrous oxide (N₂O). Also called *laughing gas* by Davy (1800) because of its euphoric effect when used as an anesthetic (see *Narcosis*), nitrous oxide is the oldest narcotic given by inhalation, and has a relatively weak action. Used today in combination with O₂ and/or other narcotics (q.v.) (barbiturates, q.v.). Nitrous oxide has very short-lasting post-narcotic effects.

Bibliography: Hamilton, W.: The limited clinical pharmacology of nitrous oxide. *Clin. Pharmacol. Ther.*, 1963, 4, 663.

E.L.

Nociceptor (syn. *Nocireceptor*). A *pain receptor*. The exact nature of these receptors, and whether there are receptors specifically for pain and no other sense, is as yet unknown. See *Pain*.

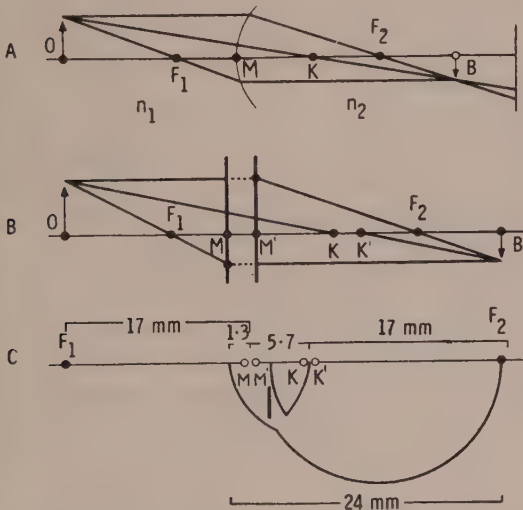
C.D.F.

Noctambulism. Night- or sleep-walking in a partially conscious state with subsequent amnesia.

W.Sch.

Nodal points of the eye. The two nodal points with the two focal points and two main points constitute the six "cardinal points" of the eye, which are important for image ray formation. A "simple optical system" has an inner focal point F_2 and an external focal point F_1 whose focal length f_1 (i.e. the distance from the corneal apex H , which is also defined as a main point) is in the same relation to the "inner focal length" f_2 as the refractive indices of the corresponding optical media. The simple nodal point N in a simple optical system is located halfway between M and F_2 on the optical axis (Fig. A).

By introducing additional refractive surfaces, in particular on the anterior and posterior surfaces of the lens (q.v.), the intact eye becomes a composite (complex) optical system with two main and two nodal points, located at a distance of 0.3 mm on the optical axis (Fig. C). For image ray formation, the eye as represented in Figure C becomes the "reduced eye" (Fig. B), in which the nodal-point ray is displaced in parallel at the nodal points N and N' .



Simple (A) and reduced complex (B) optical system. Position of the reduced system in diagrammatic representation of the eye (C). M = main points; N = nodal points; F = focal points; O = object; I = image. (Dodt, 1970.)

The angle between two nodal-point rays, which originate from two object points, is the

visual angle at which these object points appear; this angle must not be less than 60 ± 10 seconds of arc (limit angle of visual acuity), so that in emmetropia (q.v.) the image points are still represented on separate cones, on account of the size of the cone pattern on the retina. *K.H.P.*

Noetic superstructure. A term applied by strata theorists, under the influence of Lersch, to individual thought processes (power of abstraction, judgment, logical reasoning, etc.) that take place, together with voluntary activities, above the endothymic basis (q.v.) (with affects, moods, drives, etc.). Lersch combines voluntary and thinking activities in the "personal superstructure" (q.v.). See *Strata theory*.

Bibliography: Lersch, P.: The levels of the mind. In: David, H. P. & Bracken, H. von (Eds.): Perspectives in personality theory. New York, 1957, 212-17.

B.H.

Noise. Generally "noise" refers to irrelevant or unpleasant acoustic stimulation. At high levels of intensity such noise interferes with the performance of most tasks and can even cause physical damage. At lower levels, however, noise may be beneficial for some people performing certain tasks.

Noise is used as a technical term by communications engineers to refer to background interference irrelevant to the signal being transmitted. If this interference is random and contains many frequency components, it is called *white noise*. This use of the term "noise" can be applied to the visual and indeed any other modality or communication system. Hence the concept of noise in this sense has been used in the interpretation of psychophysics experiments, where it may appear as internal or "neural" noise. *C.D.F.*

Noise damage. Functional or organically detectable injury caused by persistent noise (above 85 dB at more than 1000 Hz; above

95 dB at less than 1000 Hz): especially occupational or industrial deafness (a recognized form of occupational disease) and noise-conditioned functional disorders of the CNS. Early recognition by means of regular audiometric hearing tests for personnel exposed to prolonged high-intensity noise is essential. Noise damage can be prevented to some extent by noise-control measures, such as sound absorption and insulation in building premises, and careful layout of offices and workshops, damping of resonant machine-parts, redesigning or changing the weight of components, using buffered mountings, selecting new materials, or enclosing the noise source. In default of such measures, individuals can be helped by ear defenders (plugs, etc.) and planned pauses and changes of work location.

Bibliography: King, A. J.: The measurement and suppression of noise. London, 1965. Koch, H.: Betriebslärm, seine Folgen und seine Bekämpfung. Publication of the Bundesinstitut für Arbeitsschutz. Koblenz, n.d. Newby, H. A.: Audiology: principles and practice. London, 1959. Richardson, E. G. (Ed.): Technical aspects of sound. Amsterdam, 1953. Sataloff, J.: Industrial deafness. New York, 1957. Wilson, Sir Alan: Final report of the Committee on the Problem of Noise. London, 1963. Wright, M. I.: The pathology of deafness. Manchester, 1971.

G.R.W.M.

Noise, exposure to. The frequency, intensity and duration of perceived sound in a place of work can reach a level experienced as disturbing or unpleasant and thus interfere with output or even injure hearing (occupational deafness) and lead to changes in physiological balance (Broadbent, 1961) and psychological effects ranging from a diminution of attention in tasks requiring concentration, to fatigue, lethargy and abrupt changes of mood (see Bell, 1966; Glorig, 1958; Jansen, 1963; Lieber, 1964; Rodda, 1967). Whether a sound is experienced as noise in the sense of being annoying, unwanted or unbearable depends on an individual's physical and psychological type and constitution, subjective attitude to the sound source, the sound-

pressure level measured in decibels (dB) duration of effect, consonance and dissonance defined in terms of individual and social habituation to qualities of timbre and tone combinations as agreeable or disagreeable, and temporal sequence (regular, irregular, rhythmic, and so on). The following table gives the general subjective judgments (perceived noise levels) of the *loudness* of sounds of certain *intensities* (measured in dB by *sound analyzers*—combined sound-level meters and frequency analyzers):

below 30 dB	= very quiet
30–40 dB	= quiet
40–50 dB	= fairly quiet
50–60 dB	= borderline between quiet and noisy
60–70 dB	= fairly noisy
over 70 dB	= very noisy

The following tables (Grandjean, 1967) give sample noise intensities in traffic, offices and various workplaces:

1. Noise exposure from traffic

(a) Vehicles

Vehicle	Speed in km/hr	distance in m.	Intensity in dB
Automobile	50	6	74–80
Motor cycle	60	7	81–98
Heavy lorry	50	6	85–97
Streetcar (tram)	30	5	83–90

(b) Traffic densities

Vehicles per min.	Intensity (in dB) at distance of		
	6 m.	30 m.	120 m.
100	73–77	58–63	46–51
10	63–68	49–53	38–42
1	55–59	41–46	29–33

2. Noise exposure in offices

Noise source	Intensity in dB
Back street (window closed)	45–65
Highway (main road) (window closed)	60–80
3 people	55
10 people	60
50 people	65
Telephone ringing (2 m.)	75
Normal typewriter (2 m.)	70
Noise-reduced typewriter (2 m.)	60

3. *Noise exposure in workplaces*

Noise source	Intensity in dB
Boiler shop (e.g. in navy yard/ shipyard)	90–120
Motor (engine) test stand	90–100
Automobile sheet (chassis) steel mill	90–100
Machine tools	75–90
Heavy punches	95–110
Foundry	95–115
Furniture factory	90–105
Circular saw	75–105
Hydraulic metal-planer	85–105
Textile mill (weaving shed)	95–105
Bottle-filling plant	85–95
Chocolate factory	101–106

Bibliography: Bell, A.: Noise: an occupational hazard and a public nuisance (WHO publication). Geneva, 1966. Broadbent, D. E.: Effects of noise on behavior. In: Harris, C. M. (Ed.): Handbook of noise control. New York, 1957. Id.: Effects of noises of high and low frequency on behaviour. *Ergonomics*, 1957. 1, 21–9. Id.: Non-auditory effects of noise. *Advmt. Sci.*, 1, 1961, 406–9. Glorig, A.: Noise and your ear. New York, 1958. Grandjean, E.: Physiologische Arbeitsgestaltung. Munich, 1967. Jansen, G.: Lärm im Betrieb. Berlin, 1963. Lieber, E.: Occupational health. London, 1964. Rodda, M.: Noise and society. London, 1967. G.R.W.M.

Noises, animal (syn. *Animal cries*). Sounds which operate primarily as means of communication within and between species. E.g. bird sounds can act as signals of mood or status within the group, and as warning or threat cries. Bird sounds have a wide range from simple contact notes through flight calls to nesting calls and courtship songs. In addition to voiced calls, there are mechanical sounds such as the tapping of the woodpecker.

Bibliography: Armstrong, E. A.: A study of bird song. London, 1963. V.P.

Nominalism. The theory that abstractions or universal concepts do not represent objective real particulars but are mere names, and that only objective physical particulars (“concrete things”) are (logically) real. The insistence of

logical empiricism (i.e. logical positivism) on direct or indirect verification and on linguistic analysis involves a mode of nominalism. The term has also been used (pejoratively) to refer to the practice of individuals who accept the objectivity of what they have named—thus reversing its meaning. J.C.

Nominal scale. Used as the basis for the classification of qualitative data. The only condition that a nominal scale must satisfy is that there should be a clear correlation between event and class. The classes of a nominal scale differ qualitatively, but all instances within classes are equal. Other relations (e.g. of magnitude) do not exist between classes. The sequence of classes is without significance and merely reflects external conventions. E.g.: eye color (blue—green—brown—various); family status (single—married—widowed—divorced). See *Scale; Methods of psychology*. G.Mi.

Nominal value. An attributed, assumed, general, or desired, as opposed to an actual, value.

Nomothetic. That which is directed to the establishing of universal laws. The antithesis between nomothetic and idiographic (q.v.) research has been the subject of dispute among psychologists in personality research. The aims of nomothetic personality research are: (a) to describe individual behavior in terms of general personality dimensions present in all individuals in the same way, though in different degrees; (b) to explain individual behavior with the aid of general laws. Researchers make use of the quantitative, mostly multivariate and experimental, methods of psychology. See *General psychology; Nomothetic sciences*. D.B.

Nomothetic sciences. In a celebrated paper of 1894, W. Windelband compares the

nomothetic sciences (aimed at establishing universal laws) with the *idiographic sciences* (q.v.) (which describe individuals or events). The two terms were adopted by G. W. Allport in his work on personality (q.v.), and owe their current importance to him.

P.M.

Non-directive therapy. 1. See *Client-centered therapy*. 2. *Therapeutic variables*: three psychotherapeutic variables postulated by C. R. Rogers have proved effective for successful therapy: (a) *positive valuation* and *emotional warmth* (non-possessive warmth); (b) *empathic understanding* of the client's reference point, and a concern to communicate to him what is understood (accurate empathy); (c) *congruence* (genuineness and integration). Investigations have shown that these variables apply in other forms of therapy (Bergin & Salomon). See *Psychotherapy*. L.J.

Non-parametric methods. Methods of statistical inference (especially significance tests) which do not require the existence of interval or ratio scale data. They can, however, also be applied to data of this higher scale level, and independently of the type of distribution, and are also known as "distribution-free" methods. See *Non-parametric tests*. G.Mi.

Non-parametric tests. The term covers all statistical test methods which are not based on the concept of the normal distribution and/or on the postulate of cardinal scale measurement. In the social sciences in general, and in psychology in particular, these tests are usually concerned with variables whose distribution is either unknown or differs from the normal pattern, and/or with variables whose scale characteristics have either not been clearly defined or do not reach the necessary level (see *Scaling*). Tests based on the postulate of ordinal scale measurement which only require the observations to be independent and random and are not depen-

dent on distributions (i.e. non-parametric), are generally more suitable for this purpose, because they are statistically more effective than the classical, parametric tests. These test methods are therefore of great methodological importance in psychology, even though they still lack a common theoretical foundation and are less effective than parametric tests in the case of variables which follow a standard distribution.

1. *Types of test.* Statisticians make a distinction between (a) tests to check the hypothesis of symmetry, represented primarily by the sign and sign rank tests (Wilcoxon test) (symmetry in relation to zero); (b) tests to check the hypothesis of randomness, consisting primarily of the U test and H test to check the randomness or significance of differences between two or more samples; and (c) tests to check the hypothesis of independence with Kendall's correlation and concordance tests (1962). Users of these tests distinguish between (a) tests to check differences in the central trend; (b) tests to check differences in dispersion; and (c) tests of relations (correlation, contingency, concordance).

2. *Principles.* The most important of these test methods are based on the ranks of the observed values, i.e. the measured values are converted into rank values. The information is supplied from the interval between observations arranged in order of magnitude; the observed values are therefore not dependent on the distribution, i.e. are distribution-free.

A good example is provided by the Wilcoxon-Mann-Whitney rank summation test (or U test). For the two samples 1 and 2 under examination, the measured values $x_1x_1x_2x_1x_2x_2$ (arranged in order of magnitude) are replaced by the rank values 1 2 3 4 5 6, and the rank totals $T_1 = 1 + 2 + 4 = 7$ (sample 1) and $T_2 = 3 + 5 + 6 = 14$ (sample 2) are calculated. For the null hypothesis H_0 (identical position) we would expect (approximately) identical rank totals, i.e. $T_1 = T_2$. For the (unilateral) alternative hypothesis (different position), we would

expect different rank totals, i.e. $T_1 \neq T_2$. If the observed difference $D = T_2 - T_1$, as the test value, reaches a total which, assuming H_0 to apply, only occurs in $\alpha\%$ (e.g. 5%) of all cases, we reject H_0 in favour of H_1 . The probability of error $P(D)$ in rejecting H_0 , even though it holds good (error of the first order), is obtained by randomizing the $2 \times 3 = 6$ rank values. In the assumption H_0 , every possible halving of the 6 rank values is equally probable; there are $\binom{6}{3} = 6 \times 5 \times 4/3 \times 2 \times 1 = 20$ halving possibilities, each of which gives a D value. All the D values taken together represent the test distribution for D and the highest $\alpha\%$ D values are the rejection limits for H_0 . In our example we obtain $\binom{6}{3} = 20$ combinations of 6 observations in the third class, i.e. 123456, 123456, 123456, 123456, 123456, 123456, 123456, 123456, 123456, 123456, 123456, 123456, 123456, 123456, 123456, 123456 and the D values 9 7 5 3 5 3 1 1 1 3—3—1—1—3—5—3—5—7—9. The 5% rejection range consists of the 5% (algebraically) highest values, i.e. $5\% \times (20) = 1$ D value, so that the unilateral 5% significance barrier $D_{0.05} = 9$. In our example this D value is not reached with $D = 7$, so that H_0 must be retained; the D value has an error probability of $P = 2/20 = 0.10$, since 2 D values of the null distribution for D (i.e. 7 and 9) reach or exceed the observed value of $D = 7$.

Non-parametric tests are based on these and similar principles. They can be understood without any knowledge of infinitesimal calculus, since they conform quite simply to the rules of combinations. Instruction in their use therefore presents no problems.

A distinction is made between exact tests (as in the test method described above) for small samples and approximation tests (asymptotic tests) for large samples (for which exact tests would be too complex). For larger N_1 and N_2 values with a mean value of zero and a variance of $N_1 N_2 / (N_1 + N_2 + 1)/3$, D follows an approximately normal distribution, so that $z = D/(\text{standard$

deviation of $D)$ can be treated as a standard variable parameter. Applied to the above example, we obtain the variance $\text{var}(D) = 3 \times 3 (3 + 3 + 1)/3 = 21$ and the standard deviation $\text{SD}(D) = 21 \approx 4.6$ so that $z = 7/4.6 = 1.52$. This z value is smaller than $z_{0.05}(\text{unilateral}) = 1.65$ so that, for our example, H_0 would be retained even after the asymptotic test. In general, the asymptotic test is less effective (all other considerations being equal) than the exact test.

The main tests described in handbooks on non-parametric test methods (e.g. Siegel, 1956; Walsh, 1965; Bradley, 1968; Lienert, 1971) are listed below.

3. *The main tests.* (a) The most effective test for comparing the position or location of two independent samples is the rank summation test, or its derivative—Mann-Whitney's U test; in addition to randomness and independence of the sample, the only requirement is homogeneity, i.e. an identical pattern of distribution, of the associated populations. If this requirement is not met, the (weaker) median test is used to test for position differences (homologously with the t test). The most effective position test for dependent samples is Wilcoxon's matched pairs sign rank test. This is based on symmetrically distributed differences between the observational pairs and their homogeneity. If the postulate of symmetry or homogeneity is not, or not fully, met (e.g. if there are unilateral extremes in the sample of differences, or if the pairs come from different populations), the weaker sign test will be used instead of the sign rank test (by analogy with the test for differences).

(b) The Siegel-Tukey test is the most effective for dispersion comparison of two independent samples. This test presupposes an identical situation of the two populations and is similar to an omnibus test (responding to differences both in dispersion and in position) if the positions differ. At present there is no dispersion test which is not sensitive to position (like the homologous F

test); no dispersion test has been developed for dependent samples (see Walker & Lev, 1963, 1960).

(c) The H test (as a global test) and Nemenyi's multiple tests for the comparison of (in each case) two samples are used to compare the positions of several independent samples (in the same manner as one-way analysis of variance). Friedman's global test and Dunn's multiple tests are used to compare several dependent samples (in the same manner as two-way analysis of variance) (see Wilcoxon & Wilcox, 1964).

(d) The generalized Siegel-Tukey test (Meyer-Bahlburg test) is used to compare the dispersion of several independent samples (by analogy with Bartlett's test).

(e) The Kolmogoroff-Smirnov test and Cramer-von Mises test are used for omnibus comparison of two independent samples (with reference to dispersion, etc.).

(f) The Kolmogoroff-Smirnov adaptation test is used to compare a sample distribution with a population distribution.

(g) Kendall's tau test or Tukey's test (instead of the r coefficient test) are used to check the relationship between two continuously distributed characteristics in a bivariate sample. Both these test methods assume a monotonous pattern for the relationship or regression lines. Non-monotonous relationships are tested by means of information statistics (Attneave, 1959).

(h) The relationship between two alternative or dichotomously distributed characteristics is tested by Fisher's exact fourfold test (for small samples), or asymptotically with the fourfold χ^2 test (for large samples).

(i) The relationship between two multi-class characteristics and k and m classes is tested exactly by means of Freeman and Halton's test (see Maxwell, 1961).

(j) The relationship between several multi-class characteristics or several rank evaluations for a single multi-class characteristic is determined by means of Kendall's concordance test.

4. *Conclusions.* In psychological research,

non-parametric tests are preferable to conventional tests for the following reasons: (a) the population distributions of psychological variables are often either unknown or abnormal; (b) the variables rarely meet the stringent requirements of interval scale dignity for the conventional tests; (c) the samples are generally small and often include extreme values so that the central limit value theory (for conventional tests) no longer holds good; (d) the regressions between two psychological variables are rarely linear but generally monotonous. Under these four conditions, non-parametric tests are generally more efficient and valid than the conventional test methods. For descriptive purposes, the median value will be given preference over the mean value, and the interquartile or decile range (90th percentile minus 10th percentile) used instead of the standard deviation, while the rank correlation coefficient (tau or rho) will be chosen in place of the product moment coefficient.

Rating values for the population median, the median displacement from one population to another (on the basis of a given treatment effect), and for the rank correlation, can be determined on the basis of simple logical principles. Non-parametric test planning with several influencing values and interaction tests are still not fully developed. This also applies to non-parametric time series analysis and multivariate tests, and in particular to multivariate analysis of variance. It should always be remembered that non-parametric (and indeed conventional) test methods assume that samples are taken at random from their populations, but (unlike conventional tests) they make no assumptions on the pattern of distribution of the populations. See *Statistics; Statistical tests*.

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London, 1961. Siegel, S.: Nonparametric methods for the behavioral sciences. New York, 1956. Walker, H. M. & Lev, J.: Statistical inference. New York, 1963. Walsh, J. E.: Handbook of nonparametric statistics, Vol. 2. Princeton, N.J., 1965. Wilcoxon, F. & Wilcox, R. A.: Some rapid approximate statistical procedures. Pearl River, N.Y., 1964.

G. A. Lienert & V. Sarris

Nonsense syllables. *Artificial syllables* first devised by Ebbinghaus (1885) and used in investigations into verbal learning; they consist of a vowel between two consonants ("CVC"), e.g. gim, joz, lur, wam, vob. In learning experiments, lists or pairs of nonsense syllables are memorized and later reproduced. Their meaninglessness is intended to guarantee that the learning and memory processes under investigation can be studied as far as possible in a "pure" state, i.e. independently of different individual responses to familiar material. (See *Memory*.)

Nonsense syllables are only *more or less devoid of meaning*. The *sense content* is frequently determined by the "association value", and this can be defined by the number of associations to a syllable which occur to a testee within a certain period of time. Other variables of nonsense syllables have also been investigated: e.g. ease of pronunciation. In general it is found that syllables can be learnt more easily as values for these variables rise.

In addition to nonsense syllables, *digrams* (two-letter combinations), *trigrams* (three-letter combinations) and *double syllables* are frequently used in investigations of verbal learning.

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Noradrenalin(e) (syn. *Norepinephrine*; *Arterenol*; *Levarterenol bitartrate*; *Levo-*

arterenol; *Levophed*). A hormone (q.v.) of the adrenal medulla and one of the catecholamines (q.v.), noradrenaline is a biogenic amine that acts as a transmitter substance in the ANS and CNS.

Bibliography: See *Catecholamines*.

W.J.

Norepinephrin(e). See *Noradrenalin(e)*.

Norm. A representative, average value, or set of values, for a particular group. See *Norm*, *social*; *Intelligence quotient*; *Abilities*.

*

Normal distribution. A normal distribution arises when the factors that go to make up a characteristic are numerous, independent of each other and additive in combination. The mathematical equation of the normal distribution was first described by De Moivre in 1733. A normal distribution is bell-shaped, inasmuch as the highest frequency of scores is in the middle, and the frequency tapers off symmetrically on either side of the mean.

G.Mi.

Normality. 1. The state of not deviating from the norm, or the average. 2. Approximating to a normal probability distribution; *abnormality*, therefore, is the deviation of a frequency distribution from the normal. The degree of deviation of an empirically determined distribution from the (theoretically assumed) normal distribution can be checked for statistical significance by means of the χ^2 test (q.v.). (See also *Mental defect*.) G.Mi.

Normalization. The transformation of an abnormal into a normal distribution (q.v.).

Normalized distribution. An originally abnormal distribution transformed into a normal distribution.

Normal probability curve. See *Gaussian curve*.

Normative efforts. According to Lersch: "strivings of obligation-carrying participation" (e.g. veracity, justice, duty) within the endothymic basis, and the attendant drive experiences; within the latter, strivings to rise beyond the self (with creative urges, interests, love of something). They serve suprapersonal needs and can compete, for example, with the instinct of self-preservation. See *Strata theory*.

B.H.

Norm, ethico-esthetic (syn. *Cultural norm*). An ideal type or rule for arriving at value judgments. Nowadays, it denotes a behavior pattern demanded by social institutions (a result of *socialization*, q.v.).

M.R.

Norm, social. A standard of *behavior* developed by members of a group (q.v.) to which they conform or are encouraged to comply with by penalties. Social norms, according to M. Sherif, develop gradually. If a group is faced with ambiguous information, the judgments of individual members at first vary widely. However, they gradually converge through communication (q.v.) within the group, so that the result is comparable to the *statistical norm*. In a more abstract sense norms are what group members believe ought to be done or left undone in a given situation (see *Group dynamics*). Their general binding force or soundness exerts a powerful influence on *group cohesion*.

W.D.F.

Nosophilia; nosomania. *Nosophilia*: disease-proneness; also morbid desire to be sick.

Nosomania: an insane belief that one is diseased despite the absence of detectable symptoms. Occurs in hypochondriac psychopathy. See *Hypochondria*; *Depression*; *Anan-casm*; *Schizophrenia*.

H.W.

Nostalgia, or homesickness, played a major role in Romantic psychology. Until the turn

of the century it was considered to be the cause of severe *depression* (q.v.). Today the term is nearly always replaced by others, such as *regression* (q.v.).

W.Sch.

Note blindness. The inability to interpret musical symbols in a person whose general faculties of vision and apprehension remain intact.

G.M.

Noxious stimulus. See *Anxiety*.

Nuclear and peripheral performance. Riedel's terms for work analysis: *nuclear performance* is mental performance associated directly (*dominant*) or indirectly (*non-dominant*) with the preparation of working plans and the initiative for action. *Peripheral performance* comprises all other forms of performance which support, complete and/or facilitate nuclear performance.

Bibliography: Riedel, J.: *Arbeits- und Berufsanalyse*, Brunswick, 1957.

G.R.W.M.

Nuclear neurosis (I. H. Schultz, 1918). A character-dependent, "centrifugal" neurosis which impairs (almost) all areas of life (e.g. love, sleep, work, faith), and often leads to suicide. According to Schultz, the nuclear neurosis is a synonym for *psychopathy* (q.v.) but has differential-diagnostic, hereditary-constitutional degenerative stigmata related to a psychological trauma of early childhood. *Nuclear complex* is a synonym for the *Oedipus complex* (q.v.).

K.T.

Nucleus. 1. The core of a cell. The nucleus of the ganglionic cells is large, vesicular and has a low chromatin content and a very large nucleolus. No mitoses (cell divisions) of ganglionic cells have been observed in man after birth. **2.** A cluster of nerve-cell bodies having the same or a similar function in the CNS, e.g. the *nucleus ruber* in the midbrain.

G.A.

Null hypothesis. The statistical hypothesis (H_0) which assumes that statistics (q.v.) obtained from samples do not differ, or differ only by chance, from each other or from corresponding parameters of the population. If the null hypothesis is rejected in the light of a statistical test, the alternative hypothesis (H_1) must be accepted. The null hypothesis can be refuted but not proven.

G.Mi.

Nutritive energy. According to Jung (q.v.), that part of the libido which activates behavior in regard to, e.g. eating and oral stimulation. Sucking, chewing, etc., are manifestations of nutritive energy. See *Oral stage*.

W.T.

Nutritive stage. The *nutritive* or *oral* stage in the first year is characterized by the act of sucking (oral pleasure), the mouth serving as the first means of communication between mother and child. See *Oral stage*.

M.Sa.

Nyctalopia. *Day blindness*, in which vision is more distinct at night than by day. *Congenital*: (a) *Albinism*: the absence of pigment to screen the light leads to dazzling by day; (b) total color blindness (q.v.) (disordered function of the cones, q.v.). *Acquired*: With central opacity of the cornea or lens, rays close to the axis cannot penetrate. The eye dilates the pupil excessively (see *Mydriasis*) to obtain an image with the rays at the outer edges. This leads to the admission of too much light and thus to daytime *glare* (q.v.). Not to be

confused with *hemeralopia* (q.v.). The term is, however, also used in the etymologically correct sense of *night blindness*. When used in the literature, therefore, “nyctalopia” and “hemeralopia”—if they must be preferred to their English equivalents—should always be defined.

R.R.

Nymphomania. Excessive (hetero-)sexual desire in women.

Nystagmus. Involuntary and uncontrollable eye movement made up of two components—one *slow*, the other *rapid* and acting in the opposite direction. The direction of the nystagmus is denoted by that of the rapid component. The nystagmus, which acts in the horizontal or vertical direction, serves to compensate eye positions for changes in bodily posture in space. A nystagmoid form of eye movement can also be set off involuntarily. Depending on the mechanism that triggers off the complaint, a distinction is made between: (a) *vestibular nystagmus*, caused by rotating the subject (rotatory nystagmus), or by irrigating the external auditory meatus with cold or warm water (calorific nystagmus); in each case the direction of the nystagmus depends on which semicircular canal of the vestibular system of the inner ear is the more intensely stimulated; (b) *optokinetic* (or “railroad”) *nystagmus*, caused by movement of the subject or surroundings; (c) *cerebellar nystagmus*, the result of damage to, or disorder of, the function of the cerebellum.

R.R.

O

Object; object theory. Egon Brunswik conceived of psychology as a science of objective relations, and stressed the fact that, in psychology, behavior can be described in strictly objective and quantitative terms. He showed how behavior can establish links between the tool objects of widely varying kinds present in the environment and biologically significant target effects.

Bibliography: Brunswik, E.: The conceptual framework of psychology. In: Neurath, O. *et al.* (Eds.): International Encyclopedia of Unified Science, Vol. 1. Chicago, 1952, 655–760. **Id.:** Perception and the representative design of psychological experiments. Berkeley & Los Angeles, 1956. *P.M.*

Object cathexis. According to Freud, the investing of libidinal energy in an object of experience, especially a “person-object” (e.g. mother attachment). Equivalent to learning the satisfaction values of situations, things, persons, and their recollection or the idea formed of them (Rapaport, 1959; Toman, 1960). Invariances in the objective circumstances of contact with such objects lead to the object invariances and object-immanent relations of aspects of the object in the individual’s world of experience and imagination (Kelly, 1955). Object cathexes are cumulative in effect, and the satisfaction of motives adds further knowledge about objects, and aspects thereof, to already developed cathexes. These play a part in deter-

mining the perception of present opportunities for satisfying motives. The totality of an individual’s object cathexes is his *concept of reality*.

Object anti-cathexis is equivalent to repression (q.v.) or other forms of (inner) defense (q.v.) against objects or aspects thereof. It rules out any further attempt to seek to derive satisfaction from or experience of them, or any further cathexes, i.e. any fresh expectations of satisfaction from the object or range of objects in question. The result is that even already formed object cathexes atrophy.

Bibliography: Kelly, G. A.: The psychology of personal constructs. 2 vols. New York, 1955. Rapaport, D.: The structure of psychoanalytic theory: a systematizing attempt. In: Koch, S.: Psychology: a study of a science, Vol. 3. New York, 1959, 55–183. Toman, W.: Psychoanalytic theory of motivation. London & New York, 1960. *W.T.*

Object choice. The choice of friends and love partners, partly determined, according to Freud, by earlier object ties. Parents and brothers and sisters represent a person’s original objects; relations, acquaintances, playmates, schoolfellows and friends the extrafamilial choices, and enduring friendships and love and marriage partners the (usually) most significant examples. (See *Family; Family constellation*).

Object finding is an object choice made after a search or waiting period. It is experienced in a particularly marked manner

during puberty, when a young person hankers after repressed intrafamilial personal relations but still has difficulty in perceiving opportunities for them.

W.T.

Object constancy. An object is always recognized as the same even when the stimulus context or the spatial interval changes. Often an object can still be identified even when it is only visible in part. This constancy of an object depends on the constancy with which definite qualities are perceived, e.g. shape, size or color. To explain this constancy one may refer to the gestalt principle according to which perceived objects stand out from their surroundings as complete shapes. When such a shape has once entered the memory, it is recognized again whatever the background.

P.S.

Object finding. See *Object choice*.

Objective anxiety. See *Real anxiety*.

Objective consciousness. The cognitive function of consciousness (knowledge "of" or "about"); i.e. the subject-object relationship, which can be equated with the distinction between two poles ("ego" and "non-ego"), is the basis of the concept of objective consciousness. The notion is implicit in most reflection theories of the consciousness and corresponds approximately to the notion that "man is conscious of all those things of which he has knowledge". Expressed differently, objective consciousness is the individual's knowledge of the object of individual experience.

F.N.

Objective psychology. A collective term for a psychological approach that explains psychological occurrences solely on the basis of objectively determined phenomena. It largely dispenses with constructs and rejects intro-

spection (q.v.) as a tool of research. Theories which have been formulated on these lines in the sphere of animal psychology (q.v.) and still exert influence include J. von Uexküll's environmental theory; the researches of the animal psychologists C. T. Morgan, R. M. Yerkes (q.v.) and E. L. Thorndike (q.v.); behaviorism (q.v.), founded by J. B. Watson (q.v.) in the USA; the theory of higher nervous activity developed by I. P. Pavlov (q.v.) in the USSR; and objective psychology as founded by V. M. Bekhterev (q.v.)

H.Ro.

Objective spirit (syn. *Objective mind*). For Hegel, objective spirit is the absolute idea which only exists in itself, i.e. which is represented to the conscious mind as an array of prescriptions (right, law), of institutions (morality, ethics), or of maxims for specific actions (morals). In his general psychology (q.v.), Pradines uses the term for "works of the human spirit": technology, religion, language, art and society.

P.M.

Objective tests. 1. *Definition.* In psychometrics, the term *objective test* is used explicitly or implicitly in at least three different ways:

(a) Some writers use the term to refer to tests which provide a set selection of response alternatives (e.g. yes/no, true/false, etc.) that are scored according to an agreed key or program, or tests which allow open-ended responses provided that scoring instructions are sufficiently precise for agreement between different scorers to be reached. This view of objectivity in psychometric testing centers on the question of *interscorer reliability*. A test is *objectively scored* when any competent observer can be expected to arrive at approximately the same numerical result.

(b) Another concept of test objectivity focuses on the *kind of behavior which is observed* rather than on the agreement between observers. In this view, a test is objective if it does not allow faking or distortion of the

kind that may occur if the subject is required to give a self-report or make introspective judgments of any sort, whether objectively scored or not. Included in this category are various *behavior* or *performance* tests, some of which are used as *indirect* or *disguised* measures of apparently unrelated characteristics.

It should be noted that these two different views of what is objective in psychometric testing are often directly opposed. For example, in the measurement of humor (q.v.) preferences, the two methods which have been most frequently employed are: (i) presenting a series of jokes and having the subject rate them according to a scale of "funniness", or (ii) observing overt behavior, sometimes with the aid of videotape, and categorizing it as "disgust", "indifference", "smiling", "out-right laughter", and so on. In the first case we have subjective behavior objectively scored, while the second method amounts to subjective scoring of objective behavior. Neither method is universally preferable; each has its advantages and disadvantages.

(c) The third view of what comprises an objective test is much broader than either of the other two, and is to some extent inclusive of them. In this more general view, a test is said to be objective if it yields measurements which are: (i) *comparable* with a body of results accumulated through a large amount of previous testing; (ii) *repeatable* in the sense that the same results would be obtained under the same conditions on another occasion of testing; and (iii) allow *prediction* of some behavior relevant to the attributes the test is designed to measure. That is to say, an objective test is one which is acceptable in terms of the criteria of *standardization*, *reliability*, and *validity*. The remainder of this article is devoted to an evaluation of these three concepts.

2. *Standardization*. There are two separate aspects of standardization, and a test may be "standardized" in either sense: (a) The detailing of precise instructions as to how the test should be administered, with what

materials, under what conditions, and how the raw scores should be calculated. This *standardization of procedure* is to ensure that precisely the same test is given by different testers, at different times and in different places. (b) The second kind of standardization often demanded of an objective test is the provision of *normative data* so that an individual's score can be evaluated in relation to the performance of samples comparable in age, sex, occupation, or whatever variables are considered most relevant in the situation. When an individual's score is expressed in relation to the mean and variance of a larger sample, it is called a *standardized score* (e.g. modern "IQ" scores).

While both kinds of standardization are essential if a test is to be used for individual assessment, they are sometimes held to be necessary in experimental situations too. In fact, this is not so, for the experimental psychologist is often only concerned with covariation within his sample, and has no need of information concerning the performance of other groups on his tests. Also, while it may be easier to report having used a standardized procedure, the experimentalist is in no way obliged to do so, provided that his exact procedure is fully specified. Hence, while standardization of procedure and scoring is almost always useful, and sometimes essential, it should not be regarded as a prerequisite of scientific testing in psychology.

3. *Reliability*. Reliability is also an ambiguous concept in psychometric test theory, and would be better replaced by two separate concepts: (a) *Stability* refers to the extent to which an individual may be expected to gain the same score on different testing occasions (assuming that the attribute being measured is itself stable), and is estimated by the correlation between the scores obtained on two testing sessions with the same group of subjects. Such a correlation is called a *test-retest reliability coefficient*; (b) *Internal consistency* refers to the homogeneity of the test items, and is estimated by the so-called *split-half reliability coefficient*, which is the

correlation between two randomly selected halves of the test, with a correction for the fact that the number of items upon which the correlation is based has been reduced by half. A third kind of reliability coefficient, based on the correlation between *equivalent* or *parallel forms*, incorporates elements of both stability and consistency, their proportion depending upon just how equivalent the two forms of the test are.

Concerning the importance of these two types of reliability, it is essential that any test exhibit an acceptable degree of stability; otherwise, the results can have no kind of validity, and will be quite meaningless. On the other hand, internal consistency is neither an essential characteristic of a valid scientific test, nor even necessarily a good thing. Information concerning the homogeneity of a test may be important, especially when a test is hypothetically unidimensional in content; but such information is better obtained by the methods of *factor analysis* (q.v.) or *principal components* (q.v.), which provide a much more complete picture of the dimensional structure of a test.

4. *Validity*. Validity may be loosely described as the extent to which a test measures what it is supposed to measure. Traditionally, four types of validity have been identified: (a) *Content validity* is the extent to which the items in the test appear to be good predictors, and to represent a fair sample of the behavior domain in question. While usually regarded as adequate for the construction of achievement tests, this is not validation at all in a technical sense. (b) *Concurrent validity* is the extent to which scores on the test correlate with other variables which can be regarded as suitable criteria, e.g. teacher ratings, correlations with other tests. (c) *Predictive validity* refers to the power of test scores to predict some future outcome, e.g. examination performance, suicidal attempts, and so on. (d) *Construct validity* (q.v.) refers to the gradual accumulation of evidence relating to the nature of the trait or traits being measured, particularly by the experimental

testing of hypotheses based on the theory underlying the test. J. Loewinger (1967) has argued that content, concurrent, and predictive validities are all essentially *ad hoc*, providing no adequate basis for test construction, and that construct validity is the whole of validity from the scientific point of view.

A correlation between scores on a test and some recognized criterion measure is often called a *validity coefficient*. It needs to be stressed, however, that there is no one such coefficient for any test, since validity is always relative to the purpose for which the test is being used. In addition, in the interpretation of both validity and reliability coefficients, it is often forgotten that the size of a correlation depends upon many factors, such as the amount of variance (heterogeneity) of the sample. See *Test theory; Validity*.

Bibliography: Anastasi, A.: *Psychological testing*. New York, 1961. Id.: *Testing problems in perspective*. New York, 1966. Buros, O. K. (Ed.): *Tests in print*. New York, 1971. Cattell, R. B. & Warburton, F. W.: *Objective personality and motivation tests*. Urbana, Ill., 1967. Eysenck, H. J.: *Classification and the problem of diagnosis*. In: Id. (Ed.): *Handbook of abnormal psychology*. London, 1960. Nunnally, J. C.: *Tests and measurements*. New York, 1959. Id.: *Psychometric methods*. New York, 1967. White, R. W.: *What is tested by psychological tests?* In: Hoch, P. H. & Zubin, J. (Eds.): *Relation of psychological tests to psychiatry*. New York, 1952.

G. D. Wilson

Objective type. Among notional or conceptual types, a type that relates to objective notions and another relating to verbal notions are distinguished, corresponding to a rather concrete (objective) type or to an abstract-theoretical way of thinking. W.K.

Objectivity. 1. In psychological tests: the extent to which findings are independent of the investigator as regards the ways they are obtained, evaluated and interpreted. Objectivity is usually measured by statistical correlation methods in terms of agreement between

the results obtained by a number of investigators in tests on identical subjects. 2. As against this, personality and motivation tests, whose purpose (unlike that of a questionnaire) is not disclosed to S., are called "objective tests" (q.v.). 3. In the course of personality research, various factor analyses of questionnaire items and behavioral assessments brought to light a factor which, according to Guilford, closely resembles the hypothetical personality trait "objectivity vs. subjectivity". See *Personality*. D.B.

Object libido. According to Freud the totality of love interests directed toward other persons (see *Libido*). Contrasts with narcissistic libido (see *Narcissism*). W.T.

Object psychology. 1. The application of psychological knowledge and experience to the design of objects, e.g. operating elements (See *Coding*), control desks, drivers' cabins, indicators (see *Industrial design*). 2. Objective psychology (q.v.). G.M.

Object Relations Technique (abb. ORT). A projective technique (q.v.) developed by Phillipson (1955) on lines suggested by the British psychoanalytical school (M. Klein, W. R. D. Fairbairn). The subject is required to explain, by means of stories told about thirteen pictures (see *Thematic Apperception Test*), "unconscious object-relations" (interpreted by the author) which, according to Klein and Fairbairn, were imprinted on him by early experiences with reference persons, and which have a crucial bearing on man's relations to his environment. The author provides suggestions for evaluation and provisional standards for English subjects. The problems of determining reliability and validity have not yet been satisfactorily solved.

Bibliography: Phillipson, H.: *The Object Relations Technique*. London, 1955. F.J.B.

Object transference (syn. *Sensorial transference*; Ger. *Objektion*). According to Ach (1932) the transference of individual experiential qualities, e.g. sympathy, to an object, something imagined or a set of circumstances (e.g. "the door opened invitingly"). A distinction is made between sensory, emotional and voluntary object transference. Ach sees the cause of the phenomenon in the psychic striving to relieve the ego aspect of consciousness and thus release it for other tasks. See *Empathy*.

Bibliography: Ach, N.: *Finale Qualität und Objektion* Archiv f.d. ges. Psychol. Supplementary vol. 1932.

H.W.

Oblimax method. An analytical oblique method of rotating the factor matrix. It is a generalized form of the quartimax criterion (see *Factor analysis*; *Quartimax criterion*; *Rotation*). The criterion equation

$$O = \frac{\sum \sum s_{ip}^4}{(\sum \sum s_{ip}^2)^2} = \max$$

requires the steepness of the distribution of the elements of the factor structure matrix (s_{ip} , reference vector correlations) to attain a maximum. G.Mi.

Oblimin methods. A collective term for analytical oblique methods of rotation generalized from the quartimin method. The covariances of the squared elements of the factor structure matrix are reduced to a minimum. See *Factor analysis*; *Rotation*.

G.Mi.

Observation. 1. Planned contemplation directed to changing the object of observation with the purpose of acquiring new knowledge. 2. Knowledge of something resulting therefrom or occurring fortuitously.

Observational errors. Mistakes entering into some observation due to the inadequacy of the human sensory apparatus. Essential factors: attitude (q.v.), fluctuating attention, etc.

Self-observation. Observation directed to

the flow of one's own consciousness. Unsatisfactory as a scientific method since no precise knowledge exists of how far introspection (q.v.) influences and disturbs the normal flow of a psychological event. A second source of error is the necessarily inadequate description of what has been experienced.

H.J.A.

Observation of behavior. The methodically controlled, non-random, purposive examination of the actions of one or several individuals in order to discover something characteristic of (their) personality. Time-sampling methods are often used in order to obviate the difficulties of continuous observation. Bales (1956) offers a proficient observational schema in his "interaction process analysis". Observation of behavior is the most important process in the validation of test criteria.

Bibliography: Bales, R. F.: *Interaction process analysis*. New York, 1956.

G.L.

Observation type. See *Attention types*.

Obsession. A persistent, uncontrollable and unwelcome idea, which is associated with an unpleasant emotion, usually anxiety or fear, and which may lead to some form of thinking ritual or overt action in an attempt to reduce the anxiety level. Although the person resists the idea he cannot get rid of it. He does, however, recognize it as part of his own thinking. It is traditionally regarded as a neurotic rather than a psychotic symptom. See *Neurosis*.

R.H.

Obsessional neurosis. A psychologically disturbed condition in which the individual obsessively entertains or compulsively repeats specific ideas or trains of thought which shade off into compulsions when he is unable to get rid of them. Freud considered such states to represent unconscious desires of

the patient (which had not been adequately repressed but which could be gratified only in isolation, i.e. in such a way that the patient experienced them as detached from himself) as well as defense (q.v.) mechanisms acting against such desires. Some obsessional or compulsive behaviors are counting specific objects, closing doors, or continually checking to see if others have done so, while superstitious practices such as touching wood, or avoiding the number thirteen might be thought of as mild and relatively widespread obsessional symptoms. An example of an obsessional or compulsive idea is harping on the possible death of a loved one.

Bibliography: Fenichel, O.: *The psychoanalytic theory of neurosis*. New York, 1945. Toman, W.: *Introduction to psychoanalytic theory of motivation*. London & New York, 1960.

W.T.

As a rule a distinction is made between *obsession* and *phobia* (q.v.), although they sometimes occur together in the same patient. A phobia is accompanied by *acute* anxiety states. This hardly ever happens with an obsession, which exhibits greater neutrality of emotional state and sometimes a reactive fear. Phobias lie very close to the ego, whereas obsessions tend to be experienced as something more external, the patient feeling rather that he is "under siege".

J.L.I.

Obstacle sense. The capacity of certain persons, especially the blind, to perceive "noiseless", stationary objects in the environment purely by the sense of hearing, on the principle of echo location. This gift is possessed to an outstanding degree by some animal species (bat, dolphin). (See *Ultrasonics*.)

Bibliography: Griffin, D. R.: *Listening in the dark*. New Haven, Conn., 1958. Kohler, L.: *Der Fernsinn der Blinden*. *Die Umschau*, 1952, 52, 449-51. Supa, M., Cotzin, M. & Dallenbach, K. M.: *Facial vision. The perception of obstacles by the blind*. *Amer. J. Psychol.*, 1944, 57, 133-83.

M.B.

Obstruction box; obstruction method. An apparatus for measuring the strength of an animal's motivation by observing the extent to which it will voluntarily endure an unpleasant stimulus in order to reach a goal: e.g. if the animal is separated, by an electrically charged grid, from food, drink, a novel environment, or a mate, the strength of the motivation to approach these goals can be measured by the frequency of crossings or the magnitude of current that is just tolerated. Note that the situation is one of *approach-avoidance conflict* (q.v.). G.D.W.

Obstruction experiments. A type of experiment first used by Stratton in which perception is made abnormal, for example by wearing reversing spectacles. This was supposed to simulate early human development of vision and thus to allow controlled study of the development of normal perception. These experiments show that vision is disrupted only temporarily if the transforming spectacles are worn continuously. C.D.F.

Occipital. Pertaining to the occipital bone or lobe. Occasionally applied to the head in the sense of *rear, to the rear*. The main anatomical terms it occurs in are: *os occipitale* (occipital bone); *lobus occipitalis* (occipital lobe); *nervus occipitalis major* (greater occipital nerve); *arteria occipitalis* (occipital artery); *foramen (occipitale) magnum* (major orifice in occipital bone through which the brain and spinal cord are connected). G.A.

Occipital lobe. The posterior area of the cerebrum where the visual centers are located.

Occupational psychology (syn. *Psychology of work*). If work is conceived as a class of behavior patterns, then occupational psychology, or the psychology of work, is that branch of psychology concerned with the

investigation of such modes of behavior, using the traditional methods of experimental, clinical and comparative psychology, and statistics. The approaches vary, but may be roughly divided into those proper to general, differential and social psychology. The object, work itself, is therefore the essential factor which sets occupational psychology apart as a unified field.

Findings about occupational behavior lead to criteria for its improvement (reduction of fatigue, q.v., raising of safety levels, increase of job satisfaction). To attain such goals, occupational psychology cooperates with other disciplines, such as physiology, sociology, engineering science, etc.

Occupational psychology is therefore both a pure and an applied science. The two aspects must be distinguished, but are interactive.

1. *Main applications.* A summary analysis of the concept of "work" will perhaps allow some idea of the implications for psychology. Work is a mode of behavior acquired through learning. This is especially true in modern society, where occupational learning is a continuous process. Work is subjected to specific demands: *technical* (e.g. precision norms, reliability), *economic* (output, yield, speed), and *social* (occupational hierarchy, working time, etc.). Work arranges men in social groups and organizations, both within and outside a business concern or factory. Hence work cannot simply be separated from its socio-technical context. The concept of work implies the interaction of men and their environment in the wider sense of objects, tools, machines and the occupational milieu. Therefore work can be considered in terms of several reference systems, two of which may be thought of as essential.

(a) In the first of these, the worker is conceived as a component in a *technical system*, which may be simple (a place of work) or complex (man-machine system, q.v.). Within this system the worker must perform specific tasks (his occupation); the psychologist attempts to analyze the functions of the worker: the identification and interpretation

of information, decisions, and sensorimotor activities. The results of such analyses help toward the proficient design and redesigning of machines and installations, and in the various areas covered by ergonomics (design of optimal control desks and arrays, quality control, etc.). See *Motor skills; Practice*.

(b) The second reference-system is concerned more with the worker as an individual, and concentrates primarily on personnel and occupation in the larger sense. For a long time occupational psychology was concerned exclusively with the problems arising in this sphere of human interaction. The most characteristic example here is the investigation of individual differences among workers: the results of such analyses have been used to improve methods of personnel selection and vocational counseling. This branch of occupational psychology also extends into the area of managerial studies, which includes problems of vocational training, occupational advancement, evaluation of performance, etc. Further areas of concern are the qualitative aspects of work and change of occupation. The worker can also be considered as a (dependent) member of an organization represented by the business or factory and its various component groups, but also as a member of a social group to which he belongs by virtue of his occupation (trade union, professional organization, etc.). A further area of occupational (psychological) research is the significance of the various characteristics of a specific organization for the individual worker, and the resulting possibilities for improvement.

2. *Development of occupational psychology.* One of the initial tasks of occupational psychology would seem to have been the investigation of fatigue in order to find ways of measuring and preventing its occurrence. Experimental methods were to the fore (Kraepelin, 1905; Lahy, 1910). It soon became evident that the observational areas and tasks of this new discipline were very much more varied. (See *Fatigue*.)

Münsterberg (q.v.) (1863–1916), who is

said to have been the founder of occupational psychology, defined the main lines of this new science (which he called “psychotechnics”) as lying between experimental psychology and questions of political economy. Subsequently (and for a long time), psychotechnics was concerned with questions of differential psychology (q.v.). Investigations were directed mainly to personnel selection and vocational guidance (q.v.). The improvement of test methods would seem to have been the principal concern of the psychologists of that epoch—if we are to believe the evidence of the textbooks of the period 1920–50. At first, tests were concerned exclusively with work analysis, but gradually came to have only an empirical orientation in common with it—at least for some authors. Finally, test methods were to some extent abandoned in favor of the more general objectives of occupational psychology. The limits of applicability of test procedures and the urgency of other problems in the industrial area and (especially) the military field forced occupational psychologists to turn to new questions: training, performance evaluation, machine design, organizational planning, etc. Consequently occupational psychology has come to be increasingly identified with *industrial psychology* (q.v.), which is properly restricted to a much narrower field.

Since the nineteen-fifties, some branches of occupational psychology have developed almost in their own right, but have kept their place in the general science by their attempts to structure it anew. Hence ergonomic psychology (see *Ergonomics*), which is primarily concerned with the psychological aspects of systems, has much to do not only with machine design but with questions of task-directed, proficient selection and evaluation. Similarly, the psychology of organizational systems, which has evolved rapidly since the start of the nineteen-sixties, and which essentially attempts to investigate the interaction of men and organizations, has in fact examined traditional questions of occupational psychology from a new angle.

The essential problems of the discipline are no longer treated in narrowly circumscribed areas, but in a context of constant cross-reference; for instance, one is concerned less to examine the appropriateness of an individual test than to develop methods of work placement; less to improve training for a specific machine shop than to develop training methods for specific vocational areas.

This trend helps to negate the disadvantages of over-specialization. A heavy emphasis is placed on work studies and on the preliminary diagnosis of problems in order to establish valid criteria. The multifarious factors conditioning the nature of human work demand an interdisciplinary treatment of its apparent problems. The occupational psychologist working for an organization is increasingly dependent on the cooperation of other specialists. See *Social psychology*.

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J. Leplat

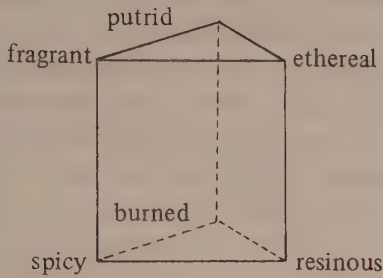
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Occupational therapy. A method introduced by H. Simon (among others) some forty years ago for use in psychiatric clinics, and based on the finding that inactivity or confinement to bed usually led to unfavorable results in the psychologically disturbed. Some form of occupational therapy is used in almost all psychiatric clinics and programs nowadays. Forms range from simple manual tasks to laundry work, agriculture or simple industrial manufacture (i.e. of consumer articles), and art therapy (drawing, painting, sculpture) and semi-artistic activities or crafts (model-making, basket-work, etc.). It is also claimed by some that occupational therapy within a group can assist insight into one's condition and improve sociability, etc., and that individual "creative" occupations assist verbal insight and self-confidence. See also *Art, psychology of; Literature, psychology of; Music therapy; Group therapy*. A.Hi.

Odor prism (syn. *Olfactory prism; Smell prism*). H. Henning postulated six basic (subjective) olfactory qualities (odors) which

could be represented diagrammatically as a prism whose surfaces stand for the "mixed" odors.

F.N.



Oedipal stage. See *Oedipus complex*.

Oedipus complex. According to Freud, the special pattern of the child's relations to his parents after reaching the early genital stage (q.v.). The boy yearns to discover the anatomical sex difference of his mother, and vies with his father for her favor. He builds up a wish to dispose of his father, by whom he imagines he is threatened with castration. Renouncing some of his sexual desires, he identifies himself with the father. In this stage the girl similarly desires her father and treats her mother as a rival, later identifying herself with her and forgoing some of the sexual wishes she entertains toward her father. An incomplete breaking-down of the Oedipus complex is said to lead to psychological disorders in schoolchildren (e.g. school phobias), neuroses (q.v.) and perversions (q.v.) (genital stage). According to Adler, the brothers or sisters can complicate the Oedipus complex. Variants established by objective data on the family situation have been shown to have different long-term effects on a person's social behavior outside the family (Toman, 1969). See *Family*.

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W. Toman

Oestrogen. See *Estrogen*.

Oestrus. See *Estrus*.

Olfactometer. An apparatus for controlling the presentation of smell stimuli to a subject, as used in psychophysical studies of smell thresholds and smell mixtures. A variety of models have been developed: some small devices, others occupying an entire room.

G.D.W.

Olfactory bulb (syn. *Olfactory lobe*). Either one of two bulbs, which are extensions of the cerebrum toward the eyes and act as smell centers.

Olfactory cells. In the olfactory epithelium of the *regio olfactoris* (q.v.) two types of cell can be differentiated, the supporting cells and the real olfactory cells. The latter are equipped with olfactory hairs on their free surface and represent simultaneously receptor (q.v.) and nerve cell. The neurites of the olfactory cells pass as fascicles through the cribriform plate and enter the olfactory bulb. No adequate explanation has yet been advanced for the way in which the stimulus in the olfactory cells is transformed into an excitation to be transmitted. When there is only a minute concentration of a volatile material, the "perception threshold" is reached first of all, i.e. "something" is smelled, but only when the concentration increases can the nature of the material be determined (specific threshold).

R.R.

Olfactory prism. See *Odor prism*.

Oligophrenia. Synonymous with the term *amentia* (q.v.): mental deficiency, mental defect (q.v.) and mental subnormality. V.K.J.

Ololuiqui (*Morning glory*). Seeds of the Mexican bindweed of the family Convolvulacea (*Rivea corymbosa* and *Pomea*

violacea), or domestic morning glory. With "peyote" (see *Mescaline*) and "Teonanacat" (see *Psylocybin*), one of the major magical drugs of pre-Spanish Mexico. Tests with the seed or synthetically produced ololuiqui have so far failed to produce noticeable hallucinogenic effects. The main effects of ololuiqui are disagreeable vegetative sensations. Increasing the dose leads to progressive clouding of consciousness.

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Onanism. See *Masturbation*; *Coitus interruptus*.

Oneirology. See *Dream analysis*.

One-sided test of significance. Unilateral significance test. See *Significance*.

One-trial learning. The proficient acquisition of a skill, etc., on one trial. See *Practice*.

One-word sentence. A phenomenon which appears as a child develops its linguistic powers and which denotes the condensation of the meaning of a whole sentence into a single word (e.g. "balla" = I want that ball). These monoverbal sentences are normally used by the child between the ages of twelve to eighteen months, but they can occur even later. Even the adult in a state of great emotional excitement (e.g. anxiety, fury) will occasionally use the one-word sentence to communicate his needs and sensations to others.

K.E.P.

Only child. See *Child, only*.

Ontogenesis. The individual's development from zygote to the sexually mature state. See *Biogenetic law*.

H.Sch.

Ontology. The theory (or philosophy) of being as being, i.e. of basic principles of being.

Onychophagy. *Nail chewing or biting*; a behavioral disorder occurring mainly in children and occasionally persisting into adult life (especially under acute psychological stress). Can be interpreted psychoanalytically as fixation (q.v.) at the oral stage (q.v.) of libido (q.v.) development. W.Sch.

Operant conditioning. See *Conditioning, classical and operant*.

Operational definition (syn. *Operation(al)ism*). In grappling with the problem of simultaneity within the context of Einstein's Special Theory of Relativity, the American physicist P. W. Bridgman demanded in 1927 in *The Logic of Modern Physics* that the concepts used in science should be defined through a sufficiently accurate description of the procedures used by the investigator in establishing and testing them. The concepts "simultaneity" and "length", for example, would thus be "operational", and therefore satisfactorily defined, if the procedures adopted in establishing "simultaneity" or measuring "length" were fully described. Where general validity is assigned to this rule, the corresponding critical and methodological approach tends to be termed "operationism" or "operationalism" (synonymous terms which Bridgman repeatedly rejected on the ground that they claimed too much for the method). Bridgman hoped that by applying scientific concepts to concrete procedures he could divest scientific terminology of inconsistent and contradictory meanings, since neither of these faults exist in the actual physical situations. The interest aroused by Bridgman's theories, first among psychologists in the USA, and later in other countries, was surely due to the prospect of banishing ambiguity and obscurity from the

language of science, and hence to the hopes it raised of avoiding many futile controversies. Moreover, other influential trends in American philosophy and psychology grew up around Bridgman's methodological criteria. These included American pragmatism (q.v.) or instrumentalism (C. S. Peirce, W. James, J. Dewey) and logical positivism (q.v.) or empiricism, popularized mainly by members of the Vienna School who emigrated to the USA (R. Carnap, H. Feigl, H. Reichenbach, *et al.*), who underlined the need to restrict scientific language to verifiable intersubjective propositions and create a unitary science or unitary scientific language—thus, at first, behaviorism (q.v.), which sought to limit psychology to statements about observable intersubjective behavior. (In Europe, H. Dingler propagated views closely related to Bridgman's theory.) The best-known representatives of the operationist standpoint include S. S. Stevens, E. G. Boring, E. C. Tolman and B. F. Skinner. In the psychological sphere, too, only such concepts and propositions as can be asserted and verified intersubjectively by independent observers through repeatable procedures are permissible. Thus, intelligence (q.v.) and anxiety (q.v.) would be defined by an adequate description of the procedures necessary to bring them into play and grasp them. As time went on, criticism of the theory led to its being far more loosely formulated, both by Bridgman (1959) and by other adherents of the operationist school. A central role was played by the problem of the relationship between interoperationally defined and theoretical concepts, between observational and theoretical language (Carnap, 1956). The discussion is still going on, and views on the subject among exponents of scientific psychology are far from uniform.

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F. Buggle

Operation(al)ism. See *Operational definition*.

Operational method. A method used in forming theories where an operational definition (q.v.) applies. The approach deliberately dispenses with any explanation of an internal relationship which direct observation cannot detect and which can therefore only be grasped intuitively.

R.Hä.

Operator. A symbol applied to a mathematical quantity (e.g. vector, q.v.) which it transforms. An operator can be used only in connection with other quantities.

G.Mi.

Ophthalmology. The branch of diagnostic and therapeutic medicine concerned with eye disorders and diseases.

Ophthalmometer. See *Astigmometer*.

Opiates. These are usually psychotropic substances pharmacologically related to morphine (q.v.). The term is less commonly applied to alkaloids of opium (q.v.) not resembling morphine.

W.B.

Opinion change. A process in which an opinion is altered or replaced by another.

There would seem to be no distinction between this and what is known as "attitude change" (q.v.), except that the variables altered in that process are usually opinions, i.e. observable verbal statements about relatively complex phenomena (assertions which nevertheless derive from basic, detectable attitudes proper). *H.-D.S.*

Opinion polls (*Opinion research; Polling; Public opinion research*). In fact, this discipline is only minimally concerned with research into opinions. These misleading but widely used terms are hardly scientific. Even if the nature of the phenomenon of "public opinion" (q.v.) (still unexplained) is disregarded, the word "opinion" takes one along the wrong track: research into attitudes (q.v.), moods, "climate of opinion", must take into account not only opinions, beliefs and convictions in the widest sense, but many other things as indicators: e.g. facts, modes of behavior, or knowledge. "Opinion research" and its analogues are also applied for scientific and practical purposes which have ceased to have anything to do with public opinion. In fact, "opinion research" does not denote any definite subject of research but the employment of a certain method, the representative and statistical inquiry involving an interview (q.v.), standardized by a questionnaire, and usually a verbal interrogation. A loose division into two parts has now become common: when this method is used to study the market, the term employed is *market research* (q.v.), everything else comes under "public opinion". Different and more appropriate terms have been used: *demoscropy* (q.v.), *surveys*, and (as a general term for the scientific field of which opinion research is a partial area) *empirical social research*.

1. *History*. The method of inquiry by "opinion polls" was developed in Europe for investigations of social conditions. A questionnaire was first used by D. Davies in 1787 and was entitled "Inquiry into the Household Budget of the Working Classes in England";

in 1848, A. von Lengerke conducted the first inquiry in Germany into the conditions of farm laborers; and in the USA there were election forecasts (1824 saw the first straw poll—a sample vote to predict the result of an election). What would seem to have been the first opinion poll in the true sense of the word was conducted in 1907 by the *Chicago Journal* and concerned an order dealing with public conveyances.

In 1906 the English statistician A. L. Bowley published an account of the representative sampling method for population statistics, and he himself was the first to use it in 1912 for such an inquiry. The idea of interrogating a relatively small but statistically representative number of selected individuals, instead of conducting *mammoth* interrogations, spread throughout the world after the *Literary Digest*, an American review, used ten million voting papers to make an incorrect forecast of the presidential election in which Roosevelt and Landon were candidates, whereas G. Gallup (q.v.) (as well as E. Roper and A. Crossley) made a correct forecast after a few thousand interviews. After that, it became more and more a matter of course to collect information about the views and behavioral habits of large groups of the population with the aid of representative inquiries, which had become relatively easy to conduct. It is difficult to assess the social and political effects of the availability of this new dimension of information acquisition; according to W. Hennis (1957), it is tantamount to conducting a plebiscite by the back door.

Even today election forecasts still play an important part in opinion research, more especially as a control of the validity (q.v.) of particular methodological concepts of sampling, the preparation of questionnaires, and the organization of field work. The fact that within a few days a representative poll is followed by a general election provides, even if there is no possibility of the appearance of new influences after the conclusion of the inquiry (before the election—at any rate) a

trial situation which it would be impossible to reproduce effectively. With regard to the tolerances of sample inquiries, validity control is concerned *not with a correct forecasting* of the successful candidate, but with the *size of the average deviation* and the *maximal deviation* between the forecast and the official result of the election.

2. *Methodological principles.* The methodological principles of opinion research are characterized in that the investigation is never directed at individuals, and never at a personality (q.v.) as a whole—at a character—but at collectives defined by common characteristics. It is not the *person* but the *characteristic* which is the object of the investigation. The person appears only as the bearer of characteristics, of variables (see *Methods of psychology*), and it is their frequency distribution (q.v.) and relation to other variables which must be determined.

As is appropriate to the field of investigation (majorities, characteristics), the technique of opinion research—apart from preliminary studies—is *exclusively* statistical, i.e. enumerative. The uniformity, or comparability, to which the characteristics are subordinated by this enumeration has to be accurately supported by preserving a rigorous hierarchy in the treatment of all methodological questions here first place has to be given to the requirement of invariance (q.v.) when collecting the data. This means: well-structured questionnaires to be read aloud verbatim to the interviewee; standardization of the interrogation situation; uniform central control of the interviewers; simplicity of all instructions for selecting the sample and for the interrogation. The greatest uniformity of all necessary steps when collecting data is a requisite for reliability (q.v.), repeatability and verifiability.

3. *Sampling.* When the subject of the inquiry has been determined, two questions remain to be answered: on what group of individuals, or on what social grouping (e.g. school classes, industrial concerns), is the report to be made? and secondly: is the

survey to be a full one or is only a sample required?

In taking a representative sample the following principle must be observed: every unit of the whole population must have the same or a calculable chance of being included in the sample. If this principle has been followed, the probability calculation (law of large numbers) can be applied to estimate within what tolerances the result obtained can be generalized, in order to apply to the whole population. Two methods are available for representative samples.

In the *random method*, the sample is chosen from the population according to the lottery principle. For this choice to be possible, the population must be easily accessible, in a physical or symbolic form (e.g. card-indexes or lists). Disadvantages: people who are especially mobile and active, and especially young men and women, are not sufficiently contacted because they are not so frequently at home; anonymity is destroyed by the selection of addresses, and coverage, i.e. the actual interrogation of those people included in the sample, is expensive and time-consuming.

The second method for preparing a representative sample, the *quota method*, assumes that some important proportions of the population are known, e.g. the distribution according to age groups, labor groups or size of locality. Based on these data, quotas (magnitudes in a genuine random selection) are calculated and distributed to the interviewers who then select a list of people for questioning according to the quotas given to them. Disadvantages of the quota method: since the selection of people for questioning is left at the final stage to the interviewers, the method may encounter difficulties. The efficacy of the quota method has been demonstrated by a number of election forecasts. No sufficiently comprehensive scientific study of the conditions and accuracy of the different selection methods is as yet available.

4. *Types of investigation.* The most usual types of investigation used in opinion polls are:

(a) The *single representative inquiry* with the interview lasting from five to forty-five minutes, the average duration being thirty minutes. Usual basis: two thousand interviews for obtaining results for sub-groups as well (sex, age, employment, political sympathies, size of locality, province); if only a general picture is required, the number of interviews is limited to a few hundred. (b) *Trend analysis*: the questions are repeated, retaining the same words and, as far as possible, the same implications of the questions, at fixed intervals, e.g. monthly, in order to measure a government's popularity. The "decay of the instrument", in other words, a change in linguistic usage or other circumstances may be a weakness; e.g. the question used since 1952 to measure the trend in the fear of price increases can no longer be used, as more than 80% of the answers regularly state that prices will rise.

Other types of investigation: (c) The *multi-stage inquiry* made in areas which are fairly inaccessible or not well known, especially where motivational research is in question: a pilot study with non- or partly structured intensive interviews (q.v.) or group discussions, and subsequent, more structured and numerically more broadly based inquiries, incorporating at every stage the knowledge gained from the previous one. (d) The *panel investigation*, a repeated interrogation of the same group of people, which is especially suitable for research into effects, e.g. the effects of election campaigns (Lazarsfeld, Berelson & Gaudet, 1944;³1968), and, more generally, to study objects for investigation containing time components or processes; example: an investigation of a change in voting intentions depending on personality characteristics. The expectation that the minimally self-confident would be most likely to waver during an election campaign proved to be correct (see *Attitude; Attitude change*), but—surprisingly—even very self-assured individuals changed their intentions more often than the average.

(e) Investigations designed as controlled

experiments are combined with all the above-mentioned methods to attempt causal explanations. In the "field experiment" of survey research—as distinguished from a laboratory experiment—interviewees remain in their accustomed surroundings; as a rule, neither they nor the interviewers know that an experiment is taking place. Lottery principles are used to make from a sample two or more test groups which do not differ from one another statistically (equalization of initial conditions); this is known as a "split ballot". The test group and control group are given the same questions and the same treatment; the experimental factor is all that is varied: e.g. the question which can be given once with, and once without, a precisely worded alternative.

If only the form of question is varied, the field experiment serves a methodological purpose, namely the investigation of the effects of types of question (the method goes back to Rugg & Cantril, 1944), and confirms the rule that alternatives must be precisely worded. Similarly, the effect of an interviewer's briefing or a method of selecting a sample is tested. Field experiments determined by content test, e.g. the influence of certain arguments, or fragments of information, on the expression of opinion.

5. *Questionnaires*. Many experiments have shown that the way questions are formulated has considerable influence on the results of opinion research, and that definition of the subject of the question and clarity and neutrality of its phrasing are very important. An additional influence is any impression carried over from previous questions, or deriving from some implication. This second point explains a principle used in constructing a demoscopic questionnaire: "An individual interview is a whole complete in itself which must be evaluated on its merits with its inner relationships (according to the interview); the individual demoscopic interview on the contrary is only a part of another 'whole', which is the survey. Every single question of the interview must be like an

identical experimental framework to which the interviewers react with their answers. The interview must, as far as possible, be not a complete whole, but ideally the *sum* of a number of questions. This explains the distinctive nature of the demoscopic interview ... in which thematically related questions are intentionally placed at a great distance from one another, or 'obliterating' or 'buffer' questions interrupt the train of thought in order to prevent subjects just dealt with from affecting subsequent questions" (W. Schwarzenauer, in: Noelle, 1963, ⁵1971, p. 49).

This is also a reason for the importance of the multiple-theme survey in opinion research—a type of survey in which quite different problems for investigation are combined without interference in one interview.

Occasionally the subject of the investigation cannot even be mentioned directly, but can only be grasped from indicators; hence the problem of validity of opinion research. New tests have constantly to be developed. Difficulties arise not so much from inhibitions preventing interviewees from speaking, but from their inability to say anything at all; the degree to which thinking and feeling are socially conditioned is also an unknown factor.

In addition to many forms of question developed by opinion research, techniques developed by psychological diagnostics are also employed in the standardized demoscopic interview: simple observation of expressions, the Thematic Apperception Test (q.v.), Rorschach charts, sign tests (E. Ring, 1965; 1967; 1970). Essential criteria of utility are the acceptability of techniques for interviewees, that interviewers should be able to use them satisfactorily, and that they should make relevant distinctions between groups of people in connection with the object of the investigation.

6. *Interviewer.* The most important qualities for an interviewer have been defined as scrupulousness and the ability to establish contact. The problem of the interviewer's influence on survey results has often been studied; it is largely a problem of the

questionnaire. With "open" questions (where there are no prescribed answers), the influence is considerable, but when there is structuring, and especially when the answer is taken from lists or packs of cards, the interviewer's influence is practically excluded (see *Interview*). There is also an advantage in distributing the interview over a large number of interviewers; that is why part-time interviewers are preferred in opinion polls. Special training is not requisite if the questionnaires have been well designed (D. Rugg, in Cantril, 1947; see Moser, 1958), and indeed it is not desirable: not the interviewer but the questionnaire has to be astute.

The roles of researcher and interviewer must be strictly demarcated; one reason is exclusion of any influence of the scientist's expectations on his results.

7. *Analysis.* The data gathered by opinion research are very suitable for scale analysis, multivariable analysis (analysis of variance), or—in general—correlational analysis, factor analysis (q.v.), and segmentation; new techniques are constantly under development. There are dangers in monotonous questionnaires, which are particularly appropriate to statistical analysis. In opinion research, the interviewer and interviewee are the weakest links in the chain: therefore their mentality and motivation (q.v.) must always be taken into consideration.

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Opium. A mixture of the phenanthrene derivatives morphine (q.v., app. 10 per cent) and codeine (q.v.), both analgesics (q.v.), the benzyloisochinoline derivatives narcotine and papaverine and other alkaloids, obtained from the dried juice of unripe poppy capsules (*Papaver somniferum*). Mainly smoked and eaten as a narcotic, especially in East Asia. Opium has marked hallucinatory, euphoric and analgesic effects. Chronic use leads to addiction. See *Drug dependence*.

Bibliography: See *Morphine*.

W.B.

Oppel's illusion. A variation of the *Müller-Lyer illusion*. The two parallel lines are divided into three equal parts, but this does not appear to be so.

C.D.F.



Optical axis. See *Eye*.

Optic chiasm. See *Chiasm, optic*.

Optic thalamus. See *Thalamus*.

Optic tract. The link between the retina (q.v.) and the visual centers. The first three neurons of the optic tract are in the retina (historically, a part of the brain). The fibers of the third neuron unite and emerge at the blind spot (q.v.) as the *fasciculus opticus* from the *bulbus*. As a part of the brain, the *fasciculus opticus* is surrounded by meninges (*pia mater* and *dura mater*). At the *sella turcica*, the two fasciculi cross in the *optic chiasm*, and continue as the *tractus optici*. The fibers coming from the nasal retinal halves of both eyes cross over here, the fibers of the

temporal retinal halves continue without crossing, while the fibers of the *foveae centrales* cross in part. The two bundles of fibers which form from them leave the optic chiasm on both sides in the optic tract. The optic tract eventually divides into the *radiatio tractus optici*, which sends fibers to the lateral geniculate body and to the anterior *corpora quadrigemina*. The optic tract continues to the visual center in the *area striata* in the cortex. The ganglionic cells of the lateral geniculate body and their neurites form the fourth neuron of the optic tract.

R.R.

Optimal performance. 1. In the occupational sphere: the working efficiency which can be achieved *temporarily* by devoting all one's energy to a specific task; fatigue sets in rapidly if effort is extended. **2.** In business and economics: production or service which can be completed in a given length of time by an organizational unit which has the best possible equipment and in which all factors liable to lead to a loss of time are eliminated.

G.R.W.M.

Optokinetics. The study of eye movements induced by stimuli, e.g. a horizontally moving field of vertical lines.

C.D.F.

Optometer. A device for measuring range of vision. Scheiner described the following simple test arrangement for determining variations. Two pins fitted one behind the other on an optical bench are viewed with one eye through a screen. Two holes are bored side by side in the screen at a distance from each other smaller than the pupil diameter. When the eye accommodates (see *Accommodation*) to the front pin, this is seen as single, the rear pin double. When the eye fixates the rear pin, the situation is reversed. See *Chromatoptometer*.

R.R.

Oral character. See *Oral stage*.

Oral contraceptives. See *Ovulation inhibitors*.

Oral eroticism. See *Cunnilingus*; *Fellatio*; *Oral-genital contacts*.

Oral-genital contacts. Contact of one partner's mouth with, or oral stimulation of, the genitals of the other partner. Practiced on male genitals, *fellatio* (q.v.); on female genitals, *cunnilingus* (q.v.). One-sided or reciprocal oral-genital contacts serve for the sexual stimulation of the partner as a prelude to coitus or for full non-coital sexual satisfaction culminating in some cases in orgasm (q.v.) To the prejudiced, these forms of sexual contact rank as "unnatural" and even "perverted". Such attitudes conflict with the findings of modern sex research, which leave no doubt as to the (statistical) "normality" of these practices, although in Western countries they occur less frequently, and are as a rule learned later, than manual-genital contacts (q.v.) and coitus (q.v.). In some cultures these forms of contact were usual, or even features of religious practices. The first scientific investigations into sex habits (Kinsey, 1948/53) suggests that oral-genital contacts are practiced by about one in two married persons in the USA.

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Oral stage (syn. *Oral phase*). According to Freud, the stage of development where the infant's interest centers on oral manipulation and stimulation, tactile stimuli and sensory reception. During the early oral stage (first four to six months) the infant has not yet built up an "object person". A change of mother under these circumstances occurs without traumatic effects. Only partial aspects of the object are already familiar to the child. During the late oral stage (lasting to the end

of the first year) the child elects as "mother" the person who regularly cares for it. It gets from the mother gratuitous and unreserved attention and contact—stimulation of all sense modalities. The child learns how to move in its immediate environment, but also relies in its movements on its mother, who lifts, holds and carries it about. According to Freud, Abraham and Fenichel, fixation and subsequent regression to the *early* oral stage can lead to psychoses (q.v.). Fixation and subsequent regression to the *late* oral stage can sow the seeds of mania (q.v.), depression (q.v.) and circular psychoses, addictions, organic neuroses (q.v.), i.e. psychosomatic disorders, impulsive neuroses (psychopathic personality traits) and hypochondria (q.v.). A change of personality—the "*oral character*"—may take the place of specific neurotic symptoms. The associated characteristics include passive dependence, a craving for attention and contacts at any price, and for unconditional love, as well as egocentric sensitivity (oral eroticism). Scolding and begging for attention are further features of oral eroticism. See *Child psychology*.

Bibliography: Fenichel, O.: The psychoanalytic theory of neurosis. New York, 1945. Freud, S.: Three essays on the theory of sexuality. London, 21962. Toman, W.: An introduction to psychoanalytic theory of motivation. London & New York, 1960. W.T.

Oral zone. The mouth and the immediately adjacent area. According to Freud it is extended to the whole body during the oral stage through the contact with the mouth made by hands and feet. Seeing and hearing assume purposeful functions as "radar detectors" (W. Toman) of immediate sensory experience and physical contacts. W.T.

Ordering test. Any test in which the subject is required to classify a number of objects in the light of various criteria (color, shape, function, weight, size, material, surface texture, value, etc.). H.-J.A.

Ordinal numbers. Numbers assigned to a ranked sequence which give the quantitative or time relations existing between the elements of the rank order (q.v.), e.g. the 1st, 2nd, . . .). Ordinal numbers do not permit any statement to be made as to the size of the intervals between elements. *G.Mi.*

Ordinal scale. A scale which permits statements of the form "greater or less than" to be made about the relations of magnitude of observed units, but not about differences in size since the units of size are neither uniform nor known. E.g.: scale for school marks.

G.Mi.

Ordinal variable. A quantitative variable to which a position has been assigned in an ordinal scale.

G.Mi.

Orestes complex. A psychoanalytic term for the alleged development of an Oedipus complex (q.v.) into a son's (repressed) desire to kill his mother.

Organ. Any specialized bodily instrument or structural part.

Organic. 1. Pertaining to an organ. 2. Characteristic of that which is bodily or vital, not merely, or not, mental, mechanical or functional.

Organic brain damage. All those influences which lead to organic injury to the brain (q.v.) and to a resulting reversible or irreversible reduction in mental capacity and performance controlled by the central nervous system. Damage may be a consequence, e.g. of traumatic brain damage caused by a blunt (concussion, skull fracture) or sharp blow (thrust, piercing), brain tumors, inflammation of the brain, degenerative processes of old

age, hereditary or other illness, a stroke, prenatal and perinatal damage, or diseases which have a secondary effect on the brain (infections, intoxications, metabolic disorders affecting the ganglionic cells in general metabolic conditions, syphilis, etc.). Impairment of mental faculties is generally accompanied by difficulty in concentrating and remembering, impaired thinking powers, rapid fatigue and psychological lability; the symptoms are heightened by heat, alcohol, nicotine and other stresses and noxious influences. See *Aphasia*; *Brain pathology*; *Mental defect*. *F.C.S.*

Organic neurosis. According to S. Freud and O. Fenichel a psychic disorder that derives from traumatic environmental conditions or such constitutional weaknesses as occur in the late *oral stage* (q.v.): Organic neuroses are said to include those diseases of adults known as psychosomatic, e.g. asthma, gastric and intestinal disorders and ulcers, faulty blood pressure, skin ailments and disorders of the joints. All have one feature in common, i.e. that chronic psychic stress conditions, which such patients feel more acutely partly because of their early traumatic experience, are alleged to bring about physical change as a direct ("natural") reaction. As against this, hysterical conversion symptoms (see *Conversion*) fulfill for the patient a particular idiosyncratic, though unconscious, need. The relations that have been established statistically are by no means clear-cut but suggest the presence in psychosomatic diseases of intermediate links in the causative chain which include special patterns of consumption and behavior. But see *Psychosomatics*. *W.T.*

Organic psychoses. These are caused by pathological changes in the brain, as opposed to functional psychoses, where no such changes are apparent. The distinction is not clear since it is now evident that metabolic changes occur in schizophrenia (q.v.) and

manic-depressive psychosis, both of which are classed as functional. Organic psychoses may be acute, usually reversible, or chronic and irreversible. See *Psychoses, functional*. D.E.

Organic sensations; articular sensations. Organic or visceral sensations arise in the internal organs and result in the experience of hunger, thirst, pain, etc. They are generally poorly located spatially, but can be used as cues in just the same way as any external stimulus. *Articular sensations* come from receptors in the joints and are crucial to knowledge of the position of our limbs in relation to each other and to the space around us. C.D.F.

Organ inferiority. In the early stages of formulating his theories (Vienna, 1907), Adler (q.v.) assumed the existence of *real* organ inferiority. Aside from its purely physiological implications, this triggers off a process of self-assertion which becomes permanent in the course of subsequent psychological development. Organ inferiority determines continuous observation and training of the organ in question whose function is regarded as inadequate. Later, Adler added the supposition that inferiority feelings (q.v.) can also be determined by social factors.

Bibliography: Adler, A.: Study of organ inferiority and its psychical implications. Washington, 1917.

J.L.I.

Organism. 1. A living animal or plant.
2. A social group (acting in concert).

Organismic psychology. A term for any psychological approach which rejects a mind-body dualism (see *Mind-body problem*) and conceives psychology behavioristically (see *Behaviorism*) or holistically (see *Ganzheit*) as the study of a/the (biological) organism. See *General psychology*.

Organization. 1. *Sociology*: order, structure, internal cohesion, interdependence of groups. 2. *Industrial psychology* (q.v.): the establishment of conditions, tasks, powers to issue instructions and order responsibilities in individual work sectors. See *Leadership*. 3. *Occupational psychology*: job supervision and staff allocation, hierarchic order, and instruction, report and information channels in business enterprises. 4. *Politics*: groupings formed at national level (e.g. trade unions, employers' associations); international or supranational level (e.g. Commission of the European Communities, ILO, UN, UNESCO), to pursue the objects laid down in their articles (programs). 5. A business concern, or other large enterprise. 6. Any structured whole or dynamically (inter)active system. See *Group*; *Role*; *Industrial psychology*; *Occupational psychology*.

Bibliography: Caplow, T.: Principles of organizations. New York, 1964. Etzioni, A.: Complex organizations. New York, 1961. Blau, P. M. & Scott, W. R.: Formal organizations. London, 1963. Whyte, W. H.: The organization man. New York, 1956. G.R.W.M.

Organizational pathology. The tendency for an organization to run down, or become essentially ineffective and non-dynamic, especially by over-formalization and impersonalization.

Organized sample. A sample (q.v.) selected so as to exhibit a specific composition in regard to one or more control characteristics, e.g. proportionality to the distribution of such characteristics in the population. Control characteristics frequently used in the organization of samples are *social status*, *profession* and *age*. Within the individual groups of characteristics the elements of the sample are chosen at random. See *Sampling methods*.

G.Mi.

Organ of Corti. The basilar membrane (q.v.) of the inner ear carries the organ of Corti,

which consists of special supporting cells, and in which the auditory receptor cells are embedded. Because of the movements of the basilar membrane, which are dependent on sound frequency and intensity, there is a mechanical stimulation of the hairs of the sensory cells, and simultaneously a mechanico-electrical transformation and excitation of the attached fibers of the cochlear nerve. *M.S.*

Organogram. A cybernetic model of information processing in the organism. See *Cybernetics and psychology*. *G.Mi.*

Organs of sense. See *Sense organs*.

Orgasm. See *Orgasm, physiology of*.

Orgasmic phase. The third phase of the sexual response cycle (q.v.) corresponding to orgasm in man and woman. *V.S.*

Orgasmic platform. The physiological response of woman under intense sexual excitement first recorded by Masters & Johnson (1966) by physiological methods. Massive vasocongestion halves the diameter of the outer third of the vaginal barrel and environment engorged tissues through regular (three to fifteen) muscular contractions. The number, duration and strength of these are physiological measures of the subjective intensity of the orgasm. The contractions, preceded by a few seconds by an initial spasm and simultaneous consciousness of the impending orgasm, are perceived and verbalized by the woman as "pulsations" in the genital region.

Bibliography: See *Orgasm, physiology of*. *V.S.*

Orgasm, multiple. Multiple orgasm arises where several (two to thirty, or more) orgasms

are achieved in a single sexual act or within a brief period (a few seconds to an hour or more). Women generally find this easier than men, who, moreover, owing to the sexual *refractory period* (q.v.), usually cannot, like women, experience orgasms in direct succession. According to Kinsey *et al.*, however, multiple orgasm is most widespread in male children and can often (15–20 per cent) occur in males aged 16 to 20, becoming progressively rarer with age. This age-dependence has not been established in women. *V.S.*

Orgasm, physiology of. Orgasm is the climax of sexual excitement and reaction which can be induced by any effective form of somato-sexual or psychosexual stimulation. It represents an abrupt, involuntary discharge of psychophysical and neuromuscular tensions, and is probably accompanied by reactions in all organs and organ systems of the body. Findings to date suggest that in any *physiological definition* of the orgasm in man or woman the following reactions need to be stressed: (a) peak intensity of sexual pleasure; (b) involuntary muscular contractions in the genital and anal areas, and many extra-genital muscle groups; (c) concentration of blood both in the genital areas (e.g. vagina or penis) and outside them (see *Sex flush*); (d) culmination of the reactions of heart, circulation and respiration; (e) partial or total loss of sensory capacities, and at times loss of consciousness for a matter of seconds or minutes. Characteristic of orgasm are the contractions of the orgasmic platform (q.v.) in woman, and of ejaculation (q.v.) in man. In physical responses (apart from ejaculation), orgasm in woman resembles that in man. The following sex-specific differences have, however, been described. A woman's subjective feelings during orgasm are more variable than a man's. The orgasm usually lasts longer in woman who, unlike man, can achieve additional orgasms immediately after the first. Moreover, more women than men need to experience a number of orgasms before

achieving satisfaction. In general, women appear to possess greater *capacity*, both quantitative and qualitative, for orgasmic response (see *Orgasm, multiple; Status orgasmicus*), although on average more men experience orgasm more regularly.

Bibliography: Kinsey, A. C., *et al.*: Sexual behavior in the human male. Philadelphia & London, 1948. *Id.*, *et al.*: Sexual behavior in the human female. Philadelphia & London, 1953. Masters, W. H. & Johnson, V. E.: Human sexual response. Boston, 1966. Sigusch, V.: Exzitation und Orgasmus bei der Frau. Stuttgart, 1970. V.S.

Orgies. Social occasions involving an extreme degree of indulgence in pleasurable and lustful activities, particularly drinking, feasting, dancing, and indiscriminate sexual activity. Reputed to be common in the days of the Roman Empire. G.D.W.

Orientation; orientation capacity; orientation loss. Orientation can have a rather limited implication as in the *orientation reflex* which refers to responses to and movements in the direction of a novel stimulus. More generally, orientation refers to the position of the body in space and in relation to its surroundings. Thus orientation loss involves the inability to tell left from right and to find one's way around. This kind of disability is particularly associated with lesions in the parietal lobe. C.D.F.

Orientation reflex. See *Orienting reflex*.

Orienting reflex. A novel stimulus arising in the environment evokes a number of responses in the organism. One group of these responses remains stable; the other group, which adjusts the receptor surface and brain structures for the effective perception of this stimulus, decreases and habituates gradually if the stimulus is repeatedly presented. The set of reactions increasing the perceptual

capacity and referred to the novelty of the signal was called by Pavlov an *orienting reflex*, or "what is it"-reflex. The orienting reflex is an integrating part of a more complex exploratory behavior released by the uncertainty of the situation, and directed toward unfamiliar objects. The orienting reflex is a unitary functional system and has several components: somatic (movements of eyes, ears, of the head and the body, smelling movements), vegetative (cardiovascular modifications, skin, galvanic response, pupillary and respiratory effects), electroencephalographic (change of brain waves, shift of the steady potential, modifications of the evoked potentials and driving responses), sensory (increase of sensitivity and of the fusion frequency of the sensory systems). The orienting reflex is characterized by non-specificity with respect to stimulus modality, a predominance of low and medium range stimulus intensity, selective extinction with respect to the features of the repeatedly presented stimulus, spontaneous recovery from the extinction with time, and temporary disinhibition after the presentation of a novel stimulus. The orienting reflex increases the effect of the stimulus on the organism, and differs from the defensive and adaptive reflexes, which tend to diminish or to eliminate the action of the stimulus. The difference between the orienting, defensive and adaptive reflexes can be demonstrated with a parallel plethysmographic recording from the finger and from the head during extinction procedure. The first presentation of sound, electric shock, cold and warmth, as novel stimuli, evokes similar orienting reflexes: constriction of the peripheral blood vessels and dilatation of the blood vessels of the brain. After a dozen presentations, the sound evokes no response because the orienting reflex has been extinguished; electric shock produces vasoconstriction in both areas because of the preservation of the defensive reflex; cold evokes stable parallel adaptive vasoconstriction, and warmth results in stable parallel vasodilatation. A change in

sound frequency, or in the location of the shock, cold, or warmth, restores the orienting reflex, which is characterized by vasodilatation at the head and vasoconstriction at the finger (Vinogradova & Sokolov, 1957).

The orienting reflex was studied initially in Pavlov's laboratory as early as 1910. These studies were carried out on animals and were devoted mainly to external inhibition of conditioned reflexes resulting from the orienting reflex. The positive effect of the orienting reflex was recorded as its motor components. Bekhterev (1932) and Ivanov-Smolensky (1933) studied the motor and vegetative components of the orienting reflex in adults and children. Using polygraphic recording, Gantt emphasized the multicomponent structure of the orienting reflex. Anokhin showed the integration of such components into a functional system. Moruzzi & Magoun's (1949) studies of arousal (q.v.) reaction stimulated electrophysiological investigation of the orienting reflex. The polygraphic recording of EEG skin galvanic response, eye movements, and so on, resulted in the differentiation of phasic and tonic, local and generalized forms of the orienting reflex (Sharpless & Jasper, 1956). The extinction of the orienting reflex is selective in respect to all properties of the repeated stimulus: its intensity, quality, duration, order of presentation, and so on. The orienting reflex is evoked by matching the stimulus against the internal trace induced during repeated presentation of the stimulus. By gradually modifying each feature of the test-stimulus, it is possible to evaluate the configuration of the internal trace and demonstrate its resemblance to an applied stimulus. This means that the brain structures build up "the neuronal model of the stimulus" (Voronin & Sokolov, 1960). The individual units participating in the orienting reflex have different dynamics of habituation. The stable "feature detectors" were found in the principal sensory pathways. The "novelty detectors" were located in the non-specific thalamus, reticular formation and hippo-

campus. Hence, the "novelty detectors" of the hippocampus, which respond to a variety of stimuli, are characterized by rapid selective habituation, and demonstrate on the single unit level the properties of the orienting reflex (Vinogradova, 1965). The selective habituation of the novelty detectors seems to depend on the synaptic efficiency of the terminals of the "feature detectors" in converging on the "novelty detectors" (Horn, 1967; Sokolov, 1960). The matrix of the modified synapses represents the neuronal model of stimulus. The greater the difference between the matrix of synapses used and the applied test-stimulus, the greater the response of the novelty detectors, and the greater the orienting reflex.

Pavlov wrote, emphasizing the role of the orienting reflex in man: "It expresses itself finally in the cognitive drive, which creates science, and gives and promises unlimited orientation in the surrounding world". The question of cognitive motivation as an emotional aspect of the orienting reflex opens up a new perspective and a new branch of psychology.

Bibliography: Anokhin, P. K.: Problems of higher nervous activity. Moscow, 1949 (in Russian). Id.: A new conception of the physiological architecture of conditioned reflex. In: Delafresnaye, J. F. (Ed.): Brain mechanisms and learning. Oxford, 1961, 188-229. Bekhterev, V. M.: General principles of human reflexology. New York, 1932. Gantt, W. H.: Experimental basis for neurotic behaviour. New York, 1944. Gershuni, G. V.: Reflexes evoked by the action of external stimuli on the sense organs as related to sensation. *Physiological Journal (USSR)*, 1949, 35 (Russ.). Horn, G.: Neuronal mechanisms of habituation. *Nature*, 1967, 215, 707-11. Ivanov-Smolensky, A. G.: The methodology of the study of the conditioned reflexes in man. Moscow, 1933 (Russ.). Moruzzi, G. & Magoun, H. W.: Brainstem reticular formation and activation of the EEG. *Clin. Neurophys.*, 1949, 1, 455-73. Pavlov, I. P.: Lectures on conditioned reflexes, Vols. 1, 2. New York, 1928, 1941. Sharpless, S. & Jasper, H.: Habituation of the arousal reaction. *Brain*, 1956, 79, 655-80. Sokolov, E. N.: Neuronal models and the orienting reflex. In: Brazier, M. A. B. (Ed.): The central nervous system and behavior. New York, 1960, 187-212. Id.: Perception and the conditioned reflex. Oxford,

1963. **Id.**: Mechanisms of memory. Moscow, 1969.
Vinogradova, O. S.: Dynamic classification of the single unit responses in the hippocampus in sensory stimuli. *J. of higher nervous activity (USSR)*, 1965, 15, 500-12 (Russ.). **Id. & Sokolov, E. N.**: The relation of the vascular responses in the hand and in the head in some unconditioned reflexes in man. *Sechenov Physiol. J. (USSR)*, 1957, 42 (Russ.).
Voronin, L. G. & Sokolov, E. N.: Cortical mechanisms of the orienting reflex and their relation to the conditional reflex. *Proc. Int. Conf. on EEG and higher nervous activity. EEG clin. Neurophysiol.*, 1960, Suppl. 13, 335-44. **Voronin, L. G. (Ed.)**: Orienting reflex and exploratory behavior. Washington, 1965. E. N. Sokolov

Originality. A factor of *divergent* thinking (q.v.) listed by J. P. Guilford. Tests for originality require of the subject unusual ideas and suggestions for unusual applications of particular objects. G.K.

ORT. See *Object Relations Technique*.

Orthogenesis. A term first applied by W. Haacke (1893) to the theory that evolution is directed along definite lines. According to Schindewolf (1942) it explains the persistence and regular progress of evolutionary trends which cannot be accounted for by natural selection. Rensch (1947) attributes all orthogenic trends to undirected mutation (q.v.), selection and allele (q.v.) loss through fluctuations in population size. There is no reason to assume the existence of autonomous evolutionary forces on a physiologically unknown basis.

Bibliography: Rensch, B.: *Neuere Probleme der Abstammungslehre*. Stuttgart, 1947. K.Fi.

Orthoscopic drawing. The drawings of small children often display general regularities of imaginative experience which might be described as *orthoscopic shapes* (Bühler, 1930). Faces are mostly drawn from in front, and hands so as to display the palms. In

this way the child externalizes the nature of the things it grasps actively and affectively.

Bibliography: Bühler, K.: *The mental development of the child*. New York & London, 1930. M.S.

Oscillation. 1. A periodical fluctuation showing reversal of direction. **2.** In factor analysis (q.v.): the degree of non-trend variability in responses to the same item.

Oscillograph. An instrument for producing a visual record of electrical wave-forms.

Oseretzsky test. Used to determine the motor level of development in age groups from four to sixteen years. Since its publication in 1923 it has undergone many changes and amplifications. In 1931, Oseretzsky published a group test version. The most important revision is W. Sloan's "Lincoln-Oseretzsky Motor Development Scale" for the 6-13 age groups. For this test reliability scores of $r = 0.73$ to 0.94 have been recorded.

Bibliography: Oseretzsky, N.: Eine metrische Stufenleiter zur Untersuchung der mot. Begabung bei Kindern. *Z. f. Kinderforschung*, 1925, 30, 300-14.
 Sloan, W.: The Lincoln-Oseretzsky motor development scale. *Genet. psychol. Monogr.*, 1955, 51, 183-252. P.S.

Osmology. See *Osphresiology*.

Osphresiology. The science of odors and the sense of smell. Syn. *Osmology*.

Ossicular chain. See *Auditory ossicles*.

Ossification. Formation of or conversion into bone. Bone is formed not directly but through conversion of cartilaginous or connective tissue. Calcium and magnesium salts are deposited in the intercellular substance. As these inorganic salts absorb more Roentgen rays than does unossified tissue, the process

can be observed *in vivo* by the radiographer. The point at which bone nuclei or ossification of individual symphyses occur have been exhaustively investigated. A child's "skeletal age" can be determined with the aid of a few X-rays. Comparison with actual age—as with IQ (q.v.)—indicates whether bodily development is premature or retarded.

Bibliography: Tanner, J. M.: Education and physical growth. London, 1961. *H.L.*

Ostwald color circle. A system of color gradations comprising twenty-four colors arranged along the periphery of a circle at regular intervals. Opposite each hue along the diameter lies its complementary. Any color of the scale can be obtained by mixing equal parts of the spectral radiation of two adjacent colors.

Bibliography: Ostwald, W.: Colour science. London, 1931. *G.Ka.*

Other-directedness (syn. *Other-directed behavior*). A term used by D. Riesman for the opposite of inner-directed, as produced by a strict upbringing. Other-directedness results from a permissive upbringing in which the peer group is important. See *Child psychology*; *Conformity*.

Bibliography: Riesman, D., *et al.*: The lonely crowd. New Haven, Conn., 1950. *W.D.F.*

Otis Self-Administering Test of Mental Ability. An early form of brief intelligence test (q.v.) used in selecting applicants for various practical occupations at three different levels. The test largely satisfies industrial criteria but predicts ease of learning requisite skills more accurately than the likelihood of success in an occupation. It differentiates ability mainly in the medium intelligence range. *F.G.*

Otolithic apparatus. See *Sense organs*: the ear.

Outgroup. A term originated by W. G. Sumner (1906). 1. A group other than that to

which the subject belongs, this being the "ingroup". 2. Of two or more groups, that which (from the viewpoint of an investigation) is more or most rejected, or alien.

Out-of-the-body experience (abb. OBE). Hallucination in which the subject appears to see the world including his own body (= auto-scopic) from a position in space other than the position of his eyes. Of special interest to parapsychologists on account of its alleged connection with *clairvoyance* (q.v.). Celia Green distinguishes two types of "ecsomatic" or out-of-the-body experiences: the "parasomatic", where the person appears to himself to be possessed of a second duplicate body; and the "asomatic", where he feels himself to be disembodied. Also known as "astral projection" (Oliver Fox) and "traveling clairvoyance" (nineteenth-century mesmerism). *J.B.*

Output. 1. A basic term in information theory (q.v.): the signal emitted by a source. 2. *General*: energy released by a system in a given period. 3. *Psychological*: the response that actually occurs. See *Input*. *H.W.*

Oval window (syn. *Fenestra ovalis*; *Fenestra vestibuli*). An oval aperture between the middle and inner ear, which transmits vibrations to the inner ear. See *Auditory perception*; *Sense organs*.

Overachievement. Where the intellectual level attained by a pupil is regarded as a yardstick for predicting scholastic success, departures from the performance expected are known as *overachievement* or *underachievement*. Those who do better than their intelligence would suggest are known as overachievers, those who fall short of expectations are underachievers. Both terms denote only the ratio of expected to actual performance and give no indication of scholastic success. Cases in which this is incommensurate with intellectual capacity show that success at school

depends on non-intellectual personality traits such as study behavior, learning motivation, adaptability, anxiety, neuroses, or on social factors such as approachability, attitudes and group standards. *G.B.*

Overcompensation. Originally an Adlerian term for above-average performance of an initially inferior organ (e.g. Demosthenes mastered his stutter and became the greatest orator of his time). After use in conjunction with the notion of compensation (q.v.), the term has come to indicate any positive performance which goes beyond simple compensation, without necessary reference to "organ inferiority" or any feeling of inferiority. *W.Sc.*

Overdetermination. The overdetermination of, e.g. dreams and slips is their determination by (i.e. attribution to) *several* distinct (though unconscious) wishes and motives. *W.T.*

Overlearning. The continuation of practice beyond the point of the first accurate reproduction of all the material presented for learning. Overlearning improves short-term and long-term retention (q.v.). *G.H.*

Overtones. Tonal elements whose frequencies are whole multiples of the frequency of the fundamental. The interference between a fundamental and a finite number of overtones produces a clang (q.v.). See *Auditory perception; Music, psychology of*. *W.P.*

Overt response. An overt response, unlike a covert response (q.v.), is any that is observable by another person (e.g. a verbal statement). Experiments have shown that teaching programs calling for overt responses from subjects are often more successful than those restricted to covert responses. See *Instructional technology*.

Bibliography: Glaser, R.: Teaching machines and programmed learning, II. Washington, 1965. *H.I.*

Ovulation inhibitors (syn. *Fertility inhibitors*). Hormones which are used mainly as contraceptive agents and, in their current form, are taken orally for twenty to twenty-one days from the fifth day of the cycle. They contain substances related to progesterone (q.v.) known as progestins. Estrogens (ethinyl estradiol, mestranol) are added simultaneously, or later, to support the action and improve tolerance. The most important mechanisms of the action of ovulation inhibitors are: (a) reduced production of luteinizing hormone from the anterior pituitary (see *Glandotropic hormone*), inhibiting ovulation; (b) blockage of implantation of the fertilized egg in the endometrium (mucous coat of the uterus). A large number of psychological and autonomic side-effects appear during the first few months in individuals taking ovulation inhibitors. The most frequent psychic effects are dysphoria and reduced drive, especially where the preparation has a high progestogen content. Statistical investigations show that in spite of these side-effects the influence on relations with the partner is positive.

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Oxazepam (Serax). One of the benzodiazepine derivatives, related to chlordiazepoxide (q.v.) and investigated for use as a sedative in anxiety and tension states.

Oxytocin. A hormone produced by the posterior pituitary gland which stimulates uterine contraction and the release of milk by the mammarys, and is therefore implicated in childbirth.

Bibliography: Rudinger, J. (Ed.): Oxytocin, vasopressin and their structural analogues. New York, 1964. *G.D.W.*

P

Pain. Apart from the subjective feeling of hurt, objectively pain is the total set of responses an individual makes to a harmful stimulus. These responses may be described in neurological, physiological, behavioral, or psychiatric terms.

Neurologically, the adequate stimulus for pain is a change in physical energy great enough to produce actual or impending tissue damage. Responses occur in free nerve endings and are transmitted over A-delta and C fibers to the dorsal cord, where they typically synapse, cross, and project via the lateral spinothalamic tract to the parafascicular and intralaminar thalamic nuclei, but with such overlapping of innervation and branching of transmitting fibers that no constant relationship exists between stimuli and responses. Melzack & Wall (1965) propose a gating mechanism by the cells of the *substantia gelatinosa*, modulating the membrane potentials of the terminals of afferent fibers before these affect the first central transmission cells in the dorsal horn of the cord.

The pattern of physiological responses facilitates escape or avoidance behavior. Gastro-intestinal motility is inhibited, and there is increased pulmonary alveolar ventilation and oxygen consumption. The striated muscles display greater activity, with increased muscle tension and blood flow to the area of stimulation. Cardiovascular responses are complex and variable, with elevation of both systolic and diastolic pressures, pulse

rate, stroke volume, and increased peripheral vasoconstriction.

Behaviorally, those with the greatest tolerance for pain are those whose perceptual judgments of other stimuli also err on the small side, whose body images have definite boundaries, who are extraverted, not neurotic, and have relatively low anxiety. Pain tolerance decreases with lowered sensory input and exposure to frequent pain experiences. Pain tolerance increases with motivation, voluntary submission to pain, attention to another task, and anxiety reduction.

Complaints of pain as a symptom are associated on the average with older, neurotic, and intropunitive patients who come from larger laboring class families and who have a history of painful experiences. Some ethnic groups encourage complaining of pain while others discourage it. "Exaggerated" expression of pain, associated with extraversion as well as ethnic membership, is unrelated to pain tolerance.

Pain responses not only protect the body but express affect and influence interpersonal relationships. Early pain experiences associated with punishment (q.v.) and loss of parental affection shape later pain responses expressing anxiety and guilt, mimicking the behavior of a child receiving punishment. Conversely, concern about loss or guilt can elicit pain sensations. Merskey & Spear (1967) describe such psychiatric models.

Sternbach (1968) analyzes the neurological,

physiological, behavioral and psychiatric descriptions of pain responses as well as a number of pain paradoxes, and presents an integration in terms of conditioning, sensory modulation and perceptual-coping styles, with implications for both research and clinical treatment.

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Merskey, H. & Spear, F. G.: Pain: Psychological and psychiatric aspects. London, 1967. Sternbach, R. A.: Pain: a psychophysiological analysis. New York & London, 1968.

R. A. Sternbach

Paired comparisons. A method for determining the rank ordering of a series of stimuli on some dimension, involving the presentation of all possible pairs of the stimulus items and having the subject compare them on the variable in question. Frequently used in studies of evaluative continua, e.g. esthetic preferences. See *Scaling*.

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G.D.W.

Pair formation (syn. *Pair bonding*). A pair may form for one mating season or for life. Pairing usually begins with sexual maturation, but a bond may be terminated during the juvenile phase. Even in the first year of their lives, grey geese form pairs which remain attached although they mature sexually only in the second year. Storks exhibit a kind of "impersonal pair formation": they become attached to the nesting site but not the partner.

V.P.

Paleoencephalon (syn. *Paleoencephalon*). The terms "palencephalon" and "neencephalon" (introduced by L. Edinger) do not represent clear distinctions. The first name is used for those parts of the brain which are older phylogenetically (i.e. all sections of the brain apart from the cerebral cortex and closely associated structures); nevertheless, since the old and new elements in the brain stem

(*diencephalon*, *mesencephalon* and *rhombencephalon*) are all closely connected, the above-mentioned division of the vertebrate brain is not usual, in *comparative anatomy* at least. See *Neuroanatomy*.

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K.Fi.

Paleopsychology. The application of psychological hypotheses to prehistory; according to S. E. Jelliffe, a subfield of paleobiology (the study of fossils as organisms). The reconstruction of the psychological characteristics of prehistoric man relies not only on archeological finds (e.g. shackling the dead: possibly an expression of a fear that the spirits of the dead would return), but very much on the results of cultural anthropology (q.v.), where the difficulties are those peculiar to any comparative reconstruction.

W.Sch.

Palimnesis. Recollection, bringing back into one's memory (q.v.) what had escaped it. See *Reminiscence*.

H.W.

Pallium. That area of the cerebral cortex (cerebral hemispheres) which partly covers the brain stem is the pallium, or *pars palliaris*. By definition, the stem ganglia and the brain stem do not form part of the pallium. G.A.

Palmograph. Apparatus to record fatigue produced by manual movements in a straight line.

F.-C.S.

Pancreas. A gland situated in the back of the abdomen and having both endocrine and exocrine functions. As an exocrine gland, over twenty-four hours it forms and secretes 1-1.5 liters of digestive juices which pass through the pancreatic duct into the small intestine; it is controlled by the autonomic nervous system and humorally, e.g., by secretin. The

digestive juices contain proteases such as trypsin, chymotrypsin, and peptidases for digesting protein, esterases such as lipase, lecithinase, phosphatase and cholinesterase for digesting fats and lipoids, as well as carbohydrases such as amylase and maltase to digest carbohydrates. For the endocrine function, which controls carbohydrate metabolism, see *Langerhans islet cells* and *Insulin*.

E.D.

Panel interview. See *Interview*.

Panic. A sudden state of anxiety (q.v.) ("losing one's head"), which can lead to considerable reduction of cortical control of behavior in individuals, whether alone or in a crowd. The rapid spread of such states in a crowd is explained, *inter alia*, by the effects of ideomotor mechanisms (the "Carpenter effect"; see *Ideo-real law*).

H.D.S.

Pansexualism. The doctrine that all human behavior can be explained in terms of sexual motivation, a point of view ascribed to Freudians by their critics. See *Depth psychology*; *Psychoanalysis*; *Sexuality*. G.D.W.

Paper-and-pencil tests. Those tests which require only question papers, answer paper and a pencil, since the testee himself does the writing. Such tests are usually appropriate for group testing.

P.Z.

Papillary lines. Prominent lines on the surface of the hands and feet, especially at the ends of the fingers and toes, which differ in each individual and are used in dactyloscopy as a means of identification; they have little diagnostic value. See *Handlines*.

H.W.

Paradoxical cold; paradoxical warmth. Sensations of cold and warmth can result from

stimuli not objectively considered so. Paradoxical cold can result when a stimulus of about 42°C activates a cold receptor, and paradoxical warmth when a stimulus of about 30°C activates a hot receptor.

C.D.F.

Paradoxical intention. In logotherapy (q.v.), this method consists of compelling the patient to do what he is afraid to do. A technique used especially in treating phobias (q.v.). Paradoxical intention has been used with less success in more serious cases of obsessional and compulsive *neurosis* (q.v.) such as anancasm (q.v.).

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J.L.I.

Paragnosia. Extrasensory perception (q.v.). The term is popular with Dutch parapsychologists but is seldom encountered in the English literature.

J.B.

Paragnost. Person who shows special ability for paragnosia (q.v.) = *sensitive* (q.v.). J.B.

Paragraphia. Disturbed writing due to the selection of wrong words or letters. It must be distinguished from *paragrammatism* (abnormal use of grammar), and from *apraxic agraphia* (distorted lettering or format). It is parallel to the spoken disturbance of *paraphasia* (q.v.). The degree of paragraphic disturbance may vary with the mode of writing, i.e. spontaneous, copying, or to dictation.

B.B.

Parakinesia. The state of having bizarre and clumsily executed movements which are varied, and not repetitive as are mannerisms and stereotypies. Found in catatonic schizophrenia and organic brain disease. *Parakinetic*

catatonia was described by Leonhard as a sub-variety of catatonia with grimacing, constant movement of limbs and trunk, handling and touching. In organic brain disorders such movements may have a conspicuous quality, and various types are recognized, e.g. chorea and athetosis. Usually parakinetic catatonia has less pronounced movements and much less disturbance of purposeful actions. *B.B.*

Paralalia. Any speaking defect, especially the habitual substitution of one sound for another. This is not an aphasia (q.v.) but a disorder of the motor mechanisms of speech (q.v.). It may be due to an imbalance of the muscle co-ordinating system of the brain stem, cerebellum or cortex. *B.B.*

Paralexia. Form of sensory *aphasia* (q.v.), in which the ability to read is affected. *F.Ma.*

Paralgesia. Any disorder or abnormality of the sensation of pain; the term is most commonly used to denote a painful paresthesia (q.v.). *J.P.*

Parallax; parallax, binocular. If an observer moves, then objects at different distances from him will appear to move relative to each other, so that the more distant the object the smaller the movement. Hence in a train those objects near the track rush past us while those in the distance move hardly at all. This parallax effect is a major cue for depth perception and shows how crucial movement of the observer is in perception. *Binocular parallax* is an identical, but much smaller, effect due to the slight difference in position of our two eyes. *C.D.F.*

Parallelism, psychophysical. A philosophical doctrine originated by Leibniz: body and soul (mind) do not influence one another recipro-

cally, although every state of the one corresponds to a state of the other in accordance with the state of "pre-established harmony," i.e. they run parallel courses. This doctrine reappears as a heuristic attitude with Wundt (q.v.), Claparède (q.v.) and Flournoy, who admit that every psychic (mental) phenomenon has a physiological "concomitant", but do not allow that this implies *any causal relationship* between the two series of phenomena: mental processes and nervous processes represent two "sides" (aspects) of the same event. For gestalt psychologists, the bond of concomitance is, more exactly, that of isomorphism" (q.v.) (Köhler). Piaget (q.v.) adopts the same viewpoint when it is necessary to establish the mental implication of physical causality. See *Mind-body problem*. *M.-J.B.*

Parallelogram illusion. See *Sanders' parallelogram illusion*.

Paralysis. 1. An inability to move any part of the body. If a limb is affected it hangs uselessly. Causes may be physical or psychological. Hypnotic paralysis of a limb is easily produced in certain subjects. **2.** An impairment or loss of sensory function of all or part of the body. However, *anesthesia* (q.v.) would seem to be a more appropriate term. *R.H.*

Paralysis agitans (syn. *Parkinson's syndrome*). The motor weakness found in patients suffering from *Parkinson's disease* (q.v.). *C.S.*

Parameters. Statistical values of theoretical distributions or of complete populations of data. They are usually symbolized in statistical literature by Greek letters (e.g. μ , σ). *G.Mi.*

Parametric tests. Statistical methods of testing samples of interval (q.v.) or ratio variables.

Only the statistics (q.v.) of such variables represent parameter estimations (of population distribution). They are distinguished in this respect from non-parametric methods (q.v.) and, when all the prerequisites are satisfied, they are more efficient. See *Statistical tests*. G.Mi.

Paramnesia. An inability to remember past events correctly. The memory is distorted by the inclusion of false details or by a wrong temporal reference. R.H.

Paranoia. *Paranoia* and *paranoid* no longer have the simple relationship of noun and adjective. Paranoid now means *deluded*: in popular usage in English-speaking countries it is a synonym for "persecutory". A paranoid idea is a delusion, and the qualifying adjectives "persecutory", "grandiose", "religious", and so on, can all be used to precede it. Its use is not restricted to schizophrenic illnesses.

Paranoid schizophrenia is a schizophrenic syndrome in which the predominant symptoms are delusions and usually hallucinations. Thought, volitional and affective disorders may be present, but not motor symptoms. The onset varies but is usually after youth. The prognosis is variable.

Paranoia is characterized by the sole presence of delusions, i.e. paranoid ideas. At one time it was thought to be distinct from the group of schizophrenias because it did not lead to deterioration. This is not now thought to be the case. See *Schizophrenia*. B.B.

Paranormal healing. Healing that is assumed to be mediated by some agency unknown to science. Includes such diverse practices as "laying-on-of-hands", prayer, immersion at a religious shrine, and so on. Must not be confused with mere unorthodox medicine. J.B.

Paranormal phenomenon. Any phenomenon that defies explanation in terms of acknow-

ledged scientific principles. The two main classes of paranormal phenomena are the mental (see *Extrasensory perception*), and the physical (see *Psychokinesis*). J.B.

Paraphrasia. Disturbed speech due to the selection of wrong words. It is parallel to the written disturbance of *paragraphia* (q.v.). B.B.

Paraphysics. Branch of parapsychology (q.v.) dealing with the physical aspects of paranormal phenomena (q.v.) J.B.

Parapraxis. The faulty performance of a purposive act, another movement being substituted for that intended. Freud applied the term to such acts as slips of the tongue and the mislaying of objects. See *Freudian slips*. J.P.

Parapsychology. The objective study of paranormal phenomena (q.v.). Also known as *psychical research*.

1. *Status*. The status of parapsychology remains controversial. The question of the existence of any genuinely paranormal phenomena and, if so, what implications this has for psychology, still deeply divides the scientific community. There are those who refuse to concede to parapsychology any function other than that of exposing fraudulent pretensions, but there are also those who believe that it holds clues vital to the understanding of man and nature. Three reasons may be adduced for the present isolation of parapsychology from the main body of science and of psychology: (a) its failure to produce any repeatable experiment of an unequivocal kind; (b) the outrageous character of its claims; (c) the lack of any coherent theory of *psi* (q.v.). As a result, findings are rarely accepted for publication in the official organs of science and there are few full-time

workers in the field. Nevertheless, parapsychology has always been able to count upon the support of scholars and scientists, sometimes of great eminence, from a wide variety of backgrounds.

2. *History.* The traditional province of the paranormal is to be found in religious miracles, in witchcraft, in magic and in occult lore of all ages and places. To these were added in the course of the nineteenth century: (a) the clairvoyant (q.v.) manifestations associated with Mesmerism; and (b) mediumistic phenomena associated with the widespread cult of *spiritualism*. The first serious attempt to subject the supernatural in all its guises to the cold scrutiny of science can be identified with the founding of the Society for Psychical Research in London in 1882 under the leadership of Sidgwick, Myers and Gurney, who were inspired by the hope that something might yet be salvaged of the belief in the immortality of the soul which had been so rudely shaken by the confrontation of science and religion in Victorian England. The early period, which we may take as extending from c. 1880 to c. 1930, was thus largely dominated by the survival (q.v.) problem. This was the period of such internationally famous physical mediums as D. D. Home and Eusapia Palladino and such brilliant mental mediums as Mrs Piper and Mrs Leonard. During this period the first systematic attempts were also made to carry out tests of extrasensory perception on selected *sensitives* (q.v.). Among the most important were the series which the American novelist Upton Sinclair carried out with his wife as subject. It was after testing Mrs Sinclair that the English psychologist, McDougall (q.v.), the Professor of Psychology at Duke University, decided that the time was ripe to set up a parapsychology laboratory there, and appointed a junior colleague, J. B. Rhine (q.v.), to be its first director in 1927. This event inaugurated the modern era in parapsychology. Mention may also be made of another outstanding sensitive, Stefan Ossowiecki, a Polish engineer who flourished

in Warsaw during the 1920s and 1930s. He is best remembered for his success in reproducing drawings and inscriptions presented in opaque sealed envelopes.

The second period, which extends from c. 1930 to the present day, has been dominated by the United States, thanks largely to Rhine and to such followers as J. G. Pratt. They started from the assumption that ESP was a universal property of mind and should therefore be demonstrable with unselected populations using standardized guessing procedures and appropriate statistical analyses (see *ESP cards*). Rhine's first book *Extra-Sensory Perception* (1934) made a greater impact on scientific opinion than perhaps any parapsychological publication before or since. This was due partly to the promise it held out of achieving repeatability, and partly to the fact that, in the early days, Rhine had the good fortune of finding several "high-scorers", among whom Pearce was the most notable. Ten years later "PK" (see *Psychokinesis*) was introduced to the world when Rhine claimed that his subjects could influence the fall of dice by their volitions alone. In Britain the ESP work was taken up by S. G. Soal, a mathematician. For some years he had no success whatever, but eventually he discovered two star subjects: Shackleton and Gloria Stewart. The series of tests which he ran on these subjects during the war years is rightly regarded as among the most important in the whole history of experimental parapsychology.

Another landmark was the announcement by Gertrude Schmeidler in 1945 of a differential scoring effect such that believers in ESP (*sheep*) tended to score above chance while sceptics (*goats*) tended to score below chance. This led to the discovery of *psi-missing* (q.v.) as a distinct phenomenon, and to a spate of studies dealing with the relationship between ESP scores and personality patterns.

On the Continent of Europe, the older tradition of qualitative tests on selected sensitives persisted; its two most active exponents were W. Tenhaeff of the University of

Utrecht and H. Bender of the University of Freiburg (Breisgau).

The high hopes felt at the start of the new era have not been fulfilled. Successive claims to have discovered consistent psi-effects have often failed to be corroborated while, for whatever reason, good subjects have become ever scarcer. Recent years have witnessed a revival of interest in some of the traditional areas of parapsychology. Hypnosis, survival, reincarnation, poltergeists, haunts, out-of-the-body experiences, psychometry and psychic photography, are all traditional topics that have been tackled afresh with new techniques and more sophisticated approaches. Furthermore, M. Ullman, a psychiatrist, has staked a claim for parapsychology in the growing field of sleep-research by setting up a "Dream Laboratory" at the Maimonides Hospital, New York, where some success has been attained in attempting to influence dream imagery telepathically.

At the present moment, parapsychology confronts us with the following unresolved paradox: on the one hand, the continuing accumulation of evidence and the fact that spontaneous phenomena are as frequent and insistent as they ever were makes this field impossible to ignore; on the other hand, the prospect of any degree of experimental control or any real theoretical understanding seems as remote as ever.

For recent surveys, see the special number of the *International Journal of Neuropsychiatry* (1966) and Rao (1966).

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parapsychology. Springfield, 1966. Rhine, J. B.: Extra-sensory perception. Boston, 1934. Id. et al.: Extrasensory perception after 60 years. Boston, 1940, ²1960. Schmeidler, G. R. & McConnell, R. A.: ESP and personality patterns. New Haven, 1958. Sinclair, U.: Mental radio. Springfield, Ill., ²1962. Soal, S. G. & Bateman, F.: Modern experiments in telepathy. London, 1954. Tenhaeff, W. H.: De Voorschouw (fore-knowledge). The Hague, 1962. Tischner, R.: Über Hellsehen und Telepathie. Munich, 1921. Vasiliev, L. L.: (Eng. trans.) Experiments in mental suggestion. Church Crookham, Hants., 1963. Warcollier, R.: La télépathie. Paris, 1921 (Eng. trans., rev. ed.: Experimental telepathy. Boston, 1938).

J. Beloff

Parasympathetic. The parasympathetic division of the autonomic nervous system (q.v.) is concerned with energy conservation effects and conditions the *tropotropic* phase of an organism—characterized by rest, recuperation, nourishment and elimination. It has opposite effects to the sympathetic (q.v.) system, which is responsible for energy expenditure effects—the *ergotropic* phase of ANS activity. Originating and control centers of the system are the diencephalon (q.v.), medulla, and sacral marrow. A distinction is made between a *cranial* part, embracing the vagus nerve and innervating the head, neck and thorax as well as parts of the abdomen, and a *sacral* part supplying chiefly the rectum and the urogenital system. Pharmacologically, the parasympathetic is stimulated by pilocarpine, muscarine (q.v.), acetylcholine (q.v.) and physostigmine (q.v.), and inhibited by atropine (q.v.) and nicotine (q.v.). See *Arousal; Emotion; Nervous system.* E.D.

Parasympathicolytic. Pertaining to the action of drugs which block or inhibit parasympathetic (q.v.) activity. *Parasympathicolitics:* such drugs. See *Anticholinergic; Psychopharmacology and ANS.* W.J.

Parasympathicomimetic. Pertaining to the action of substances (*parasympathicomimetics*)

affecting the parasympathetic (q.v.) in a way comparable to its natural stimulation. Some important effects are: contraction of the pupils, lowering of heart rate, dilatation of blood vessels, increase in the motility of the gastro-intestinal tract, increase in the secretion of saliva and stomach juices; as a rule these substances do not show all these symptoms. Since complex interrelationships exist between the individual systems mentioned, there are usually quite definite patterns of effect. Most parasympathicomimetics also have central effects which interact with visceral (vegetative) ones. *Cholinergic* (q.v.) is roughly synonymous with parasympathicomimetic. See *Autonomic nervous system*; *Psychopharmacology and ANS*. W.J.

Parataxic mode. H. S. Sullivan's collective term for expectancies of purely personal implication in interpersonal relations. *Parataxic distortions* are said to occur when in social contacts earlier (especially infantile) imprinting (q.v.) is activated and projected onto the partner, who is thus made to appear other than he really is. The *prototaxic mode* is characteristic of the most primitive, infantile phase of human life; the *syntaxic mode* is a "consensually validated", mature mode of communication.

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Parathyroid glands. The parathyroid consists of four lentil-sized glands and is located against the back of the thyroid. It produces the vital parathyroid hormone, which plays an important part in calcium metabolism. Over-secretion (*hyperparathyroidism*) can result in *osteitis fibrosa cystica generalisata* (von Recklinghausen's bone disease), with decalcification, reduced mechanical bone strength, and increased secretion of calcium by the kidney (kidney stones, etc.). Under-secretion (*hypoparathyroidism*) leads to tetany and muscular overstimulation with a tendency

to tonic cramps—once frequently incident to thyroidectomy. E.D.

Pareidolia. See *Schizophrenia*.

Parental attitudes. Parental attitudes to the upbringing of their children may be conceived as a system of educational measures between which there is a kind of typological relationship. A distinction is generally made between sharply contrasting attitudes: authoritarian vs. free; rejection vs. indulgence; etc. A triple division is also possible: authoritarian—democratic—laissez faire. Parental attitude determines the child's degree of freedom to make his or her own decisions and adopt personal attitudes. The difference between concepts of child rearing depends on the varying educational targets: unconditional dependence (authoritarian education), unbridled self-development (laissez faire education), or responsible integration (democratic education). See *Attitude; Educator, personality of*. H.Schr.

Results of experimental studies. Several attempts at classification have been based on the observation of actual parent behavior. The dimensions given in the Fels Parent Behavior Rating Scales (Baldwin *et al.*, 1945, 1949; Champney, 1941; Roff, 1949) are best known, i.e. the child's dependence on the parents, or democratic attitude to upbringing control over children's behavior. Sears, Maccoby & Levin (1957) based their appraisal of parental attitudes on interviews with parents as well as on observations. Because of the vast expenditure involved in conducting observations and interviews, it is now becoming standard practice to print questionnaires (which are submitted to the parents themselves) in order to assess parental attitudes. Bronfenbrenner (1960) uses a questionnaire for children which allows them to comment on their parents. The individual parental attitudes are then evaluated by factor analysis (q.v.) of the intercorrelations between the "education" questions. According to K. Eyferth (in Herrmann, 1966, p. 24) the different

factor analyses relating to parental attitudes should coincide with W. C. Becker's system, i.e. with the following three independent dimensions: "restrictiveness-permissiveness", "warmth-hostility", "calm-anxious emotional involvement".

Recently, educational psychology has devoted considerable attention to the study of parental attitudes. In addition to defining individual dimensions and devising methods to evaluate them, the relationship between parental attitudes and the personality of the child has been studied in detail. Attitude to upbringing may be considered both as a reaction to traits in the child and as the cause of specific features (see Seitz, Wehner & Henke, 1970).

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Parent-child relationship. Life together in the family (q.v.) situation has very marked psychological consequences for children and parents. Attachment, formation of a love concept, authority (q.v.), example, the development of conscience (q.v.), implantation of attitudes (q.v.), are some of the important aspects in this field. See *Child psychology; Conscience, Criminality*.

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Paresthesia. An abnormal cutaneous sensation.

Parietal lobe (*Lobus parietalis*). One of the lobes of the cerebrum, lying wholly beneath the parietal bone. In front of it is the frontal lobe, below it the temporal lobe, and behind it the occipital. It is marked off anteriorly by the central sulcus (*sulcus centralis*), posteriorly by the parieto-occipital sulcus (*sulcus parieto-occipitalis*), and inferiorly by the posterior ramus of the lateral sulcus (*sulcus lateralis*). Its most important area is the post-central gyrus (*gyrus postcentralis*) which is the common sensation area (sensory area) for the body: its cortex contains the ends of the afferent pathways bringing information about pressure, contact, pain and temperature. G.A.

Paris School. A school of hypnosis research (see *Hypnosis*) formed under the direction of J.-M. Charcot (1825-93) in Paris toward the end of the nineteenth century (as distinct from the Nancy School, q.v.). It had great influence on the development of psychotherapy (q.v.) and the theory of neurosis. Freud (q.v.) studied under Charcot.

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Parkinsonism. A disorder reminiscent of the symptoms of Parkinson's disease (q.v.). It occurs in arteriosclerosis of the cerebral blood vessels (arteriosclerotic Parkinsonism), after epidemic encephalitis (postencephalitic parkinsonism) and after hypoxic damage (e.g. sustained in attempts to hang oneself). In certain doses, neuroleptics (q.v.) may cause (reversible) parkinsonism as a side-effect. *Toxic parkinsonism* may occur after (carbon monoxide) poisoning. C.Sch.

Parkinson's disease (syn. *Parkinson's syndrome*; *Idiopathic parkinsonism*; *paralysis agitans*). A (hereditary) degenerative disease in the basal ganglia of the brain, the characteristic symptoms of which usually appear after the age of forty: slow, ineffective movement, weakness and heightened tonus (muscular rigidity, "cogwheel rigidity"), the body bent stiffly forward, a shuffling walk ("festination"), fixed expression, trembling (see *Tremor*) of the extremities and sometimes of the head. Medication often alleviates the suffering involved. Neurosurgery (see *Stereotactic methods*) may often have a favorable effect on rigor and tremor. C.Sch.

Parkinson's law. A part-satirical, part-sociological attempt to express in terms of rules certain phenomena in the social areas of administration and industry; e.g.: every official or employee wants to increase the number of his subordinates but not his rivals; officials or employees make work for one another; administrators expand their domains without regard to the amount of work that has to be done. This last suggestion, in particular, has not been shown to be universally true of large organizations (see Blau & Scott, 1962, for a comparative study).

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Parthenogenesis. The reproduction of progeny from unfertilized eggs. The number of chromosomes (q.v.) is maintained either because it is not reduced by division when the egg is formed, so that the eggs are diploid (q.v.), or because haploid (q.v.) eggs are produced by haploid individuals (e.g. drones), in which, when sex cells are subsequently formed, no division by reduction takes place. H.Sch.

Partial correlation. A parametric method of determining the correlation between two vari-

ables when the influence of other variables on the observed correlation has been excluded. If the influence of a variable (3) on the correlation between the variables (1) and (2) is to be eliminated, the partial correlation is determined according to the following formula:

$$r_{12.3} = \frac{r_{12} - r_{13}r_{23}}{\sqrt{(1 - r_{13}^2)(1 - r_{23}^2)}}.$$

In psychology, excluded variables frequently deal with age. See *Correlational techniques*.

G.Mi.

Partial instincts (syn. *Part-instincts*; *Component instincts*). Described by Freud as component instincts and instinct gratifications. According to Freud, exhibitionism, voyeurism, sadism and masochism are partial instincts of the sexual instinct and of striving for sexual gratification. More far-reaching are Freud's ideas about the differentiation and channelling of instincts and libido into an increasing number of partial instincts or instinctual derivatives. According to Toman, this kind of differentiation of motives forms part of the psychic development of the individual. See *Drive*; *Instinct*. W.T.

Part-instincts. A psychoanalytic concept: specific manifestations of the libido (q.v.) in conscious experience, e.g. particular urges, desires, wishes. See *Partial instincts*. G.D.W.

Participation. 1. Taking part or involvement in an activity. 2. The greater (though still limited) involvement of personnel in company policy decisions (which affect them directly). See *Industrial psychology*; *Occupational psychology*. G.R.W.M.

Partners, animal. Some vertebrates "become engaged" and "get married". Even fish, e.g. perch, form strong bonds which last a considerable time. Grey geese provide a good example of a lasting "marriage" (K. Lorenz).

It is a postulate that the individual partners should know one another. Some birds which return to the same breeding site for many years, e.g. storks, are "married" to the locality. *K.Fi.*

Part-whole relation. This became significant for psychology when the gestalt school showed that there are wholes (e.g. a melodious succession of notes) which cannot be equated with the "sum" of isolated parts. The non-summativity of a whole consists in the fact that a change in or removal of one part affects all other parts.

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Passion. Extreme emotion of any kind, but particularly sexual love. Strong enthusiasm for a person, thing or activity. *G.D.W.*

Past, experience of the. That form of personal experience oriented to individually experienced, temporally distant events. Past experiences are usually embedded in a more or less richly structured reference system whose reference points represent striking external events and intimately self-proximate experiences. See *Memory*; *Reminiscence*. *P.T.*

Patellar reflex (syn. *Knee-jerk reflex*). The involuntary reaction of the thigh extensor muscle, *quadriceps femoris*. It is elicited by a sharp blow on the patellar tendon, causing the muscle and its muscle radii (acting as extension receptors) to stretch slightly. The patellar reflex is used by neurologists and psychiatrists to study the function of the spinal cord and general nervous excitability. The latter is increased when central inhibitory mechanisms are eliminated, and decreased when there is damage to the afferent neurons. *E.D.*

Pathognomy. 1. (syn. *Pathognomics*). The study of, e.g., emotion (q.v.) in terms of externally apparent *expression* (q.v.). 2. The recognition of disease (in terms of its essential signs).

Pathology. The general theory of disease, embracing the theory of cause (etiology), origin and development (pathogenesis), outward forms and signs (symptomatology), nosology (pathological anatomy). *H.W.*

Patriarchy (syn. *Patriarchate*). A social system or type of society in which the family group is dominated by an elderly male, or more generally, a society in which males are dominant over females (ant.: *matriarchy*). *G.D.W.*

Pattern. 1. Any specimen, sample, instance or example. 2. An archetype (q.v.). 3. Form, in the sense of (*gestalt*) *structure* (see *Ganzheit*). 4. More often met with in modern psychology in the sense of *model* (q.v.), *prototype*, or *frame of reference*.

Pattern analysis: the identification of test items which are in some (specific) way concordant.

Pattern discrimination: response by S. to the whole structure rather than one or more of its parts. *J.M.*

Pattern Perception Test. E.g.: L. S. Penrose's paper-and-pencil intelligence test with sixty-seven items. Every problem (item) consists of five diagrams. S. has to find those four of the five diagrams which make up a complete pattern. The test has eight grades of difficulty. It can be used with all testees from the age of six, irrespective of intelligence (q.v.). Verified data on reliability and validity are not available. See *Progressive Matrices*. *F.Ma.*

Pauli Test. ("Work curve" according to E. Kraepelin.) Standardized by R. Pauli (1938, 1943) and W. Arnold (1951-61). The test provides information about psychological capability (concentration, quality of performance, etc.) and dynamics of performance (time taken, amount done, fatigue, etc.). The testee has to add numerals from one to ten as rapidly and accurately as possible, and at three-minute intervals make a mark to show how much he has done. Retest reliability (one month) = 0.96, and for error count = 0.68.

Bibliography: Arnold, W.: *Der Pauli-Test*. Munich, 1969. P.G.

Pause. In industrial psychology: an interval; an important factor (especially in studying fatigue, q.v., monotony, q.v., and saturation, q.v.) when used in the sense of an intentional or unintentional interruption of some activity in order to improve or restore mental or physical capability. The effect of a pause, whether an interruption or a change of work, depends especially on the nature of the activity, number and length of pauses, time when pause is taken (preferably before great fatigue), and the worker's personality type (see *Traits; Type*). W.L.

Pavlov, Ivan Petrovich. B. 14/9/1849 in Rjasan (Russia); d. 27/2/1936 in Leningrad. Pavlov studied first animal physiology and then medicine at the University of St. Petersburg. His doctoral dissertation (1883) was on the function of the heart muscles. He then studied for two years under C. Ludwig in Leipzig and P. Haidenhain in Breslau. In 1890 he was appointed Professor of pharmacology at the Military Medical Academy of St. Petersburg, and Director of the department of physiology at the newly founded St. Petersburg Institute of Experimental Medicine. From 1895 to 1924 was Professor of physiology at the Academy, and from 1924 until his death in 1936 director of the Physiological Institute set up by the Russian Academy near Lenin-

grad. He was awarded the Nobel Prize in 1904 for his research into digestion.

Pavlov was much influenced by I. M. Sechenov's belief in the reflexological nature of all psychic activity. Together with Sechenov, he regarded his field as essentially physiology and not psychology. He thought that psychology would never become an independent science. He also tried to remove all psychological terms from his own and his collaborators' vocabulary. He believed that the physiology of higher nervous activity could be investigated only if the usual psychological concepts and introspective data were replaced by a completely objective method.

Pavlov's historical importance lies in his discovery and exploration of the conditioned reflex. With this, Pavlov laid the foundations of behaviorism (q.v.) and the development of modern research into learning and learning theory (q.v.) in psychology; in fact, we are indebted to Pavlov for the fundamental notions and methodology of this area. As, e.g., an APA survey has shown, Pavlov is thought of as the scientist, after Freud who most strongly influenced modern psychology. The discovery of the conditioned reflex resulted from Pavlov's experimental research into the activity of the digestive glands, which he carried out on dogs. He found that the secretion of saliva and stomach juices occurred not only when eating began, but started before then, at the sight of the food, or even when the keeper's footsteps were heard. From these observations Pavlov concluded that a stimulus (sight of food) that was originally inadequate for eliciting a reflex can, when repeatedly associated in time with a stimulus (taste of food), be sufficient to elicit the reflex (salivation). The natural, adequate stimulus he referred to as the *unconditioned stimulus*, and the reflex occurring as a natural response to it he called the *unconditioned reflex*. The originally neutral, inadequate stimulus he called the *conditioned stimulus*, and the reflex appearing as a response, the *conditioned reflex* (see *Conditioning, classical and operant*).

Pavlov followed up this discovery by

systematic studies of the most diverse conditioning phenomena which have become the foundation for almost all learning theories: *extinction*, *reinforcement*, *generalization*, *discrimination*, etc. As a result of these investigations, Pavlov concluded that—in contrast to the genuine reflexes, which are mediated *subcortically*—the conditioned reflexes are mediated at a cortical level. He also based a theory of cortical excitation and inhibition on his results; he used this theory to explain and integrate his findings in neurophysiological terms—in this he differed from American learning theorists. Pavlov also extended his experiments into the field of psychopathy (q.v.). By conflict (q.v.) situations produced experimentally in which animals were confronted with tasks they could hardly perform but could not evade (e.g. discrimination between very similar sounds, one of which signified “food”, the other “no food”), he created phenomena resembling neuroses which (in 1923) he called “experimental neuroses”. (See *Neurosis*.) See *Orienting reflex*; *Soviet psychology*.

Main works: Collected works (in Russian). Moscow & Leningrad, 1951 (German translation: *Gesammelte Werke*. Berlin, 1953–55). The work of the digestive glands. New York, 1902. Conditioned reflexes: an investigation of the physiological activity of the cerebral cortex. Oxford & New York, 1927. Lectures on conditioned reflexes, Vols. 1 & 2. New York & London, 1928/41. The reply of a physiologist to psychologists. *Psychol. Rev.*, 1932, 39, 91–127. Selected works (in English). Moscow, 1955. Autobiography. In: Selected works (*op. cit.*), 41–4. Experimental psychology and other essays. New York, 1957.

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W.W.

by children. It is sometimes so strong that a child is completely terrified and upset, and can scarcely be reassured. The suggestion of latent epilepsy has very rarely been borne out. Children and adults with *pavor nocturnus* are generally “neurotic”, and to some extent anxiety-prone. But this does not mean that a child who has suffered from *pavor nocturnus* for some years will necessarily become an anxiety neurotic. See *Anxiety*; *Neurosis*. 3. *Pavor diurnus*: the occurrence of the same or a similar reaction during the day. J.L.I.

Pearson’s correlation coefficient. See *Product-moment Correlation*.

Pearson, Karl. B. 1857, in London; d. 1936 in Coldharbour, Surrey, England. He read mathematics at Cambridge; appointed in 1884 to the Chair of Applied Mathematics at University College, London, where he remained until his retirement in 1933. In 1906, he took charge of the Eugenics Record Office founded by Galton at U.C.L. and combined in 1911 with the Biometric Laboratory to form the Department of Applied Statistics; he was its first director, and the first occupant of the Chair of Eugenics. Together with Galton and the zoologist Weldon, Pearson founded in 1901 the first biometric journal (*Biometrika*) and, in 1925, *The Annals of Eugenics*.

Pearson made a large number of valuable contributions to biological and psychological statistics. He introduced the term “standard deviation” (q.v.) and the symbol σ into statistics (q.v.), and developed the χ^2 test for goodness of fit. Continuing the work of Galton, who had a far-reaching influence on him, he devised a formula for calculating (Pearson’s) *product-moment correlation* (q.v.), worked out the method of multiple correlation, the formula for finding the probable error of correlation coefficients (q.v.), methods to calculate the correlation in the absence of normal distributions (q.v.), the contingency coefficient (q.v.), the biserial correlation coefficient

Pavor. 1. Terror or fright. 2. *Pavor nocturnus*: Intense fear felt during the night, especially

(q.v.), and published tables to facilitate statistical calculations. Pearson's aim was not merely to develop sophisticated statistical theories, but to produce methods that would make it possible to investigate biological and psychological data and relationships. He applied his methods to contemporary social questions, such as the causes of tuberculosis, alcoholism, mental retardation, etc. The results contradicted current opinion, and Pearson often had to endure attacks and hostility from medical and public authorities. Despite his considerable contribution to statistical techniques, the fact that his work awakened widespread interest in the use of statistical methods in diverse fields of science is probably more significant. See *Correlational techniques*.

Major works: The grammar of science. London, 1892; ³1911. Mathematical contributions to the theory of evolution. London, 1894-98. Tables for statisticians and biometricians. London, 1914.

Bibliography: Morant, G. (Ed.): A bibliography of the statistical and other writings of Karl Pearson. Cambridge 1939. Pearson, E. S.: Karl Pearson: an appreciation of some aspects of his life and work. Cambridge, 1938. *W.W.*

Pedagogy. 1. Educational science (q.v.). 2. The study of educational methods. 3. Classroom technique and didactic methodology. The term is usually reserved for this narrower area of education, although its use is tending to disappear altogether in the English-speaking world, where the distinction between, say, *educational psychology* (q.v.) and *pedagogical psychology* is preserved in the more precise demarcation of *instructional technology* (q.v.) from the educational sciences proper.

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Pedantry. 1. Excessive love of order and formalism. 2. Fussiness and excessive attention to trifles, and inattention to essentials. 3. Excessive attention to private interests and inattention to general matters. 4. The ostentatious (needless) display of (needless) learning. An imprecise term in personality assessment.

Bibliography: Sacherl, K.: Die Pedanterie. Göttingen, 1957. *K.Pa.*

Pederasty. Anal intercourse with a young male. 2. Generally (and imprecisely): male *homosexuality* (q.v.).

Pediatrics. Branch of medicine dealing with all the diseases of children (usually up to the age of fourteen to sixteen years). *E.D.*

Pedology. The scientific study of biological, psychological, sociological and philosophico-anthropological aspects of the life and development of children. Recently the emphasis has been on the healthy child's *physiological* (morphological, functional, mental and psychological) development from birth to the end

of puberty. See *Child psychology; Development; Differential psychology; Educational psychology*. M.Sa.

Pedophilia. 1. Sexual deviation from a socially prescribed, instinctual or sexual object (an unrelated and socially mature partner of the opposite sex). 2. Sexual attraction for, and a preference for sexual intercourse with, children of one's own and/or of the opposite sex. Pedophilia centers upon the immaturity of the child, and is less a matter of the child's sex. The degree of immaturity is more important in homosexual than in heterosexual pedophilia. Pedophilia is a social problem since sexual use of, or intercourse with, children is a punishable offense in most countries. H.M.

Pemolin(e). A psychotropic (q.v.) substance, belonging to the CNS-stimulant group. In small doses, pemoline enhances performance for several hours without any manifest increase in subjective activation and motor excitation (in contrast to most other stimulants). Pemoline was investigated pharmacologically and psychologically as early as 1956, and in 1966 began to interest psychopharmacological learning research after the suggestion (Glasky & Simon) that it promoted RNA formation. There is, however, no proof of specific improvements in learning and recall, beyond a general increase in activation. Positive and negative findings are approximately equal, both in humans and in lower animals. No definite influence has been shown in cerebral disorders with reduced recall.

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Penis envy. 1. According to Freud, a girl's transient reaction (commencing in the early genital stage, q.v.) to the discovery of the

anatomical difference between sexes. Both girl and boy are said to tend to regard the female organ as "incomplete". It is claimed that if the child has a traumatic experience at this early stage, a more realistic conception of anatomical sex difference and of the sexual role may be delayed, envy of and rivalry with men may be prolonged, and impaired female sexual response (especially frigidity, q.v., and vaginism, q.v.) may result. The notion is contested. 2. A woman's desire to possess a penis, or to be a man. W.T.

Pentylenetetrazol (Metrazol; Cardiazol; Pentetrazol). A psychotropic substance, and one of the analeptics (q.v.); used in low dosage for, e.g., circulatory weakness or to stimulate breathing. Higher doses produce convulsions; formerly used for depression therapy. Relatively small doses, even in some normal subjects, produce an EEG spikes pattern. More recently, pentylenetetrazol has been used in psychopharmacological research into animal memory. When an injection is given up to thirty minutes after learning, there is a favorable effect on consolidation.

Bibliography: McGaugh, J.: Drug facilitation of memory and learning. In: Efron, D. H. (Ed.): *Psychopharmacology 1957-1967*. Washington, 1968. W.J.

Percentile. (Syn. *Centile*). 1. A point in a distribution of scores "up to which" a certain percentage of cases can be counted. For example, fifty per cent of the scores, cases, individuals, etc., of a distribution lie in the first half up to the fiftieth percentile (the median). The twenty-fifth and seventy-fifth percentiles are also known as the first (lower) and third (upper) quartiles. Each of the divisions of a ranked distribution would contain one hundredth of the scores, and a percentile would be any point dividing the distribution into such divisions from 1 to 100. 2. One of the actual divisions. See *Centile*. G.Mi.

Percentile score. The percentile score of a value, often used in standardizing test

methods, denotes that percentage of those cases of a distribution below a specific raw score.

G.Mi.

Perception. 1. *Definition.* Perception is a psychological function which (by means of the *sense organs*, q.v.) enables the organism to receive and process information on the state of, and alterations in, the environment.

2. Perception plays a very important role in *cognition theory* (q.v.), i.e. the theory of knowledge; the performance of the perceptual apparatus to a large extent determines both the information an organism has regarding its environment and the limits of direct cognition (knowledge). Theoretical studies have been made of the relationship between perception and "objective" reality; between perception and other psychological functions (understanding, q.v., motivation, q.v., etc.); and between experience and *a priori* cognitive categories. The main areas of experimental research are: the relationship between (absolute and differential) stimulus thresholds and one's picture of the environment ("*mundus sensibilis*"), the limitation of possible experience by sensory defects, illusions, etc.

3. *Historical development of perception research.* The nineteenth-century psychology of elements conceived perception as a process responsible for coordinating elementary sensations in terms of images and ideas which were then incorporated (generally as "apperceptions") into higher conceptual systems. However, under the influence of gestalt psychology (see *Ganzheit*), it was soon found that the perception of a total situation could not be interpreted as the simple summation of individual elements, but that the perception of totalities (gestalts or *Gestalten*) followed special gestalt laws. This distinction between element and gestalt psychology has been superseded now that the principles of systems analysis and cybernetics enable a "whole" or "totality" to be considered as a "system of reciprocally organized parts." Recent research has been characterized by a "perspectivist" approach, in which the basic conditions,

specific properties, performance and mechanisms of perception as well as the development and learning capacity of the individual are postulated as interacting, but are usually examined separately and considered in relation to other functions of the organism. (See *History of psychology*.)

4. *Theories of perception.* The methodological differences (associated with *empiricism*, q.v.) between elemental and holistic psychology were accompanied by theoretical disagreements (associated with *nativism*, q.v.). Efforts to overcome these antitheses led, in the main, to the following theoretical assumptions: (a) in transactionalism (A. Ames, W. H. Ittelson), gradient theory (J. J. Gibson) and ecological probabilism (E. Brunswik), perception is considered to be largely dependent on external circumstances, i.e. an object is always viewed in relation to a physically determinate total situation; (b) in the theories of functional dependence (expectation theory: D. O. Hebb; motivation theory: G. Murphy, J. S. Bruner, L. Postman; hypotheses theory: Bruner, Postman, Bresson; adaptation theory: H. Helson; saturation theory: W. Köhler, H. Wallach, etc.), perception is viewed as a resultant of inner (physiological and psychological) states and therefore as dependent in many respects on the individual's "set"; (c) in the genetic and constructivist (learning and development) theories (actual, local and micro-genesis: F. Sanders, H. Werner; ontogenesis, constructivism, learning psychology: H. Werner, J. Piaget, E. J. Gibson, etc.), perception is interpreted as a dynamic process in which the physical characteristics of a stimulus configuration and the performance of an (active) individual together determine what is perceived and how it is perceived.

5. *Prospects.* Although they overlap at many points, the abovementioned theories are purely "local" in nature. At best, collections of scientifically confirmed data and a few partial explanations are available; this information is seldom contradictory but generally incomplete. It gives some impression of the possibilities and development of perception in

the individual but cannot provide a full picture or model of the percipient, functioning organism. See *Attention; Auditory perception; Neuroanatomy; Visual perception*.

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R. Droz.

Perception, motivational. See *Motivational perception*.

Perception, social. See *Social perception*.

Perceptron. A learning system which processes information (q.v.) and may be regarded as a technical model of organic nervous networks. It can be used to simulate component processes of human cognition. Basically, simulation of cognition is achieved by arranging features into meanings: input sets are so classified as to produce the same output: i.e. from the multiplicity of signal patterns recorded and selected, a network of sensory elements forms invariant arrangements of signs to which, after the evaluating apparatus has passed through the learning phase, that meaning is assigned which possesses maximal similarity (see *Isomorphism*). Earlier assignments ensure a constant improvement in criteria. The perceptron can be used as a "diagnostic" machine for "feature detection" (i.e. for pattern recognition) in esthetics, and so on. (See *Cybernetics and psychology; Machine learning; Simulation*.)

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M.Ba.

Perceptual defense. If the subject is presented with different stimulus words on the tachistoscope, despite the similar structure of certain words he is not always able to say with the same speed what he has seen. Longer reaction times are observable particularly with "taboo" words, even when they contain the same number of letters as corresponding neutral words. This phenomenon is known as "perceptual defense"; no satisfactory explanation has yet been offered. See *Attitude; Avoidance behavior*.

R.Hä.

Perceptual field. The part of the area in front of the testee which he can see at any given time without moving his eye (with uniform fixation: looking straight ahead); the area may be that which can be seen by one or both eyes (monocular or binocular perceptual field). The limit of the perceptual field differs for movements and colors, and depends on the state of adaptation; in general the following figures are quoted: upwards, max. 60°, downwards, max. 70°, nasal, max. 60°, temporal, max. 90°. By contrast, the field of vision (visual field) is the area which can be perceived by a moving eye (without moving the head). See *Visual perception*. F.C.S.

Perceptual speed. J. F. Brown's studies show that in the image-retina system the perceived speed is dependent on a number of circumstances: (a) the size of the object; with an identical objective speed and identical section of the field of vision, a smaller object apparently moves faster; (b) the size of the section of the field of vision concerned; assuming the presence of two objects of identical size, that located in the smaller field of vision appears to move faster; (c) distance between the eye and object: the more remote object apparently moves faster by comparison with the nearer object and the distance traveled on the retina.

Bibliography: Brown, J. F.: Über gesehene Geschwindigkeiten. *Psych. Forschung*, 1928, 10, 84-101.

E.U.

Perceptual world. See *Merkwelt*.

Percipient. 1. Any individual with the power of *perception* (q.v.). 2. The subject or receiver in a telepathy (q.v.) experiment.

Performance. 1. Behavior (q.v.). 2. The completion of an intended or promised action. 3. The observable exercise of a skill (see *Motor skills; Practice*). See *Abilities; Learning theory*.

Performance tests. Tests in which the subject must perform some nonverbal manual task requiring intellectual ability. Since Seguin's 1846 formboard, various test-batteries have been constructed. (See *Arthur Scale; Formboards; Pintner-Patterson Scale of Performance Tests*). Performance tests are especially useful for subjects with some speech disability. Performance in these tests decreases with age more than in verbal tests. R.M.

Perimeter. An apparatus for mapping the sensitivity of different parts of the retina to various visual stimuli. Stimuli are moved from the periphery inward along a semicircular arm which rotates about its center, the eye being fixated on its radial center. *Color zones* on the retina derived in this way suggest that while black and white (brightness vision) extend well toward the periphery, blue and yellow occupy smaller, more central parts of the visual field, and red and green are more foveal still. Mapping the retina in this way is called *perimetry*. G.D.W.

Periodic fluctuations. Changes (depending on the time of day) in physiological functions, especially body temperature, blood pressure, breathing and skin resistance, linked with the increase and decrease of physiological and psychological power in respect to performance. Investigations show in general, that, within a twenty-four hour cycle there will at any time be a performance minimum at about 3 and 15 hours, and a performance maximum at about 9 and 18 hours. Changes in physiological functions at certain times during the day are conditioned by, e.g., certain meteorological influences (day-night), but also sociological and ecological influences, and awareness of time. See *Time, psychology of*.

W.L.

Periodic insanity. An obsolete term. See *Circular psychosis*.

Periodicity. Return of events at regular intervals. There are psychological phenomena which appear episodically or periodically (e.g. manic-depressive psychosis, q.v., circular psychosis, q.v., periodic drinking), but popular belief in the periodical recurrence of certain events (sleep-walking, centennial calendar) is thought by some to be so suggestive as to cause the event to take place. *H.J.A.*

Peripheral nervous system. All those nervous elements outside the brain and spinal cord: chiefly the afferent (sensory) and efferent (motor) nerves (nerve fibers). *E.D.*

Peripheral neurosis. Schultz (1958) classified the neuroses as *peripheral* or *nuclear*. The first category embraces all kinds of fairly superficial disturbances which are environmentally caused or provoked. The nuclear neuroses are more deeply anchored in the personality. The classification indicates a more favorable prognosis for the peripheral neuroses, for which Schultz recommended suggestive therapy, including autogenic training (q.v.). See *Neurosis*.

Bibliography: Schultz, I. H.: *Die seelische Krankenbehandlung*. Stuttgart, 1958. *J.L.I.*

Peripheral vision. Outside the field of central vision, i.e. beyond an area subtending about two degrees of visual angle, the retina is filled with *rod* receptors which become more widely spaced as they approach the periphery. Hence peripheral vision has lower acuity than central vision, and is monochromatic. However there is a greater sensitivity to movement in the periphery. In the dusk, when only the rods are active, peripheral vision may be superior to central vision. *C.D.F.*

Permanent memory. Many theorists distinguish short-term and long-term memory, and separate physiological mechanisms are hypothesized to account for them. One widely held

theory is that short-term memory corresponds to some kind of neural *activity*, whereas long-term memory is a function of *structural* changes in the brain (anatomical or biochemical). Although the distinction is probably arbitrary, memories do vary in permanency; the more salient psychological events, or those experiences which are likely to be relevant to future adaptation are committed to permanent memory. Such a classification of experiences and their differential assignment to memory storage has been suggested as an important function of dreaming. See *Dream*; *Memory*; *Reminiscence*. *G.D.W.*

Permissive. 1. Granting freedom. 2. Not hindering.

Permissive society: a (usually pejorative) term for various trends toward greater sufferance (though not necessarily approval) of freedom of choice in, e.g., dress, sexual mores, educational method, reading, entertainment.

Permutation. Any one of the possible arrangements or sequences of a number of items.

Persecution mania (syn. *Persecution, delirium of*). A lay term for people dominated by persecutory delusions. A misuse of the term "mania" (q.v.). See *Paranoia*; *Schizophrenia*. *B.B.*

Perseverance. There is no clear distinction between persistence (q.v.) and "perseverance", which formerly indicated "perseveration" (q.v.), but is now clearly differentiated from it, since the latter means involuntary persistence, whereas perseverance implies conscious control of the attention (q.v.) (Maller, 1944, 182). **Bibliography:** Maller, J. B.: *Personality tests*. In: Hunt, J. McV. (Ed.): *Personality and the behavior disorders*, Vol. 1. New York, 1944. *E.Mi.*

Perseveration; perseveration tendency. A term used by the psychiatrist Neisser (F. Soelder)

to cover the various pathological forms of "clinging to earlier functions" (especially for too long a period) and for the frequent recurrence of some (sensory, motor or linguistic) mode of activity. H. Ziehen (1898) and G. E. Müller and A. Pilsecker (1900) carried out the first experimental investigations of perseveration (as "reproduction without association") in children and normal adults (see *Memory*). Gross (1901) first tried to give perseveration a theoretical foundation as a "cerebral secondary function", i.e. an unconscious after-excitation of brain cells which differs in degree with each individual and is important for the associative processing of experience. In the Netherlands, Wiersma (1906) and Heymans & Brugmans (1913) worked out methods for determining individual differences in the "sensory" secondary function (e.g. flicker-fusion frequency) and in "motor" perseveration tendency (writing letters in alternating sequence); these methods are still used, though with certain modifications. Differences in perseveration tendency (or "general mental inertia") were also looked upon as an important personality factor in German typology (O. Külpe, E. Kretschmer, G. Pfahler) and in British research into intelligence and personality (Spearman, 1927). In later investigations of the relationships between different measurements of perseveration (Eysenck, 1947; Cattell & Tiner, 1949), no general perseveration factor was found, but a number of factors were—the most important of which is often thought to be identical with "rigidity" (q.v.).

Experimental investigations of perseveration in language (Mittenecker, 1953) and the information-theoretical evaluation of perseveration-like response sequences (Mittenecker, 1960) are now being interpreted along learning-theoretical lines (disequilibrium of the intensities of response tendencies).

In clinical psychology, the significance of perseveration in brain damage (Breidt, 1969) and among epileptics (Remschmidt, 1968) is under empirical and theoretical investigation. See *Attitude; Trait; Type*.

Bibliography: Breidt, R.: Perseveration und Hirnverletzung. Phil. Diss. Tübingen, 1969. Cattell, R. B. & Tiner, L. G.: The varieties of structural rigidity. *J. Pers.*, 1949, 17, 321–42. Eysenck, H. J.: Dimensions of personality. London, 1947. Gross, O.: Die cerebrale Sekundärfunktion. Leipzig, 1902. Heymans, G. & Brugmans, H.: Intelligenzprüfungen mit Studierenden. *Z. angew. Psychol.*, 1913, 7, 232–326. Mittenecker, E.: Perseveration und Persönlichkeit. *Z. exp. angew. Psychol.*, 1953, 1, 5–31, 265–84. Id.: Die informationstheoretische Auswertung des Zeigerversuchs bei Psychotikern und Neurotikern. *Z. exp. angew. Psychol.*, 1960, 7, 392–400. Remschmidt, H.: Das Anpassungsverhalten der Epileptiker. Phil. Diss. Tübingen, 1968. Soelder, F.: Über Perseveration. *Neurol. Centralbl.* 1895, 14, 958. Spearman, C.: The abilities of man. London, 1929. Wiersma, E.: Die Sekundärfunktion bei Psychosen. *J.f. Psychol. Neurol.*, 1906, 8, 1–24. E. Mittenecker

Persistence. Continuation in voluntarily undertaken and directed activities; a special aspect of achievement motivation (q.v.) including readiness to bear discomfort or pain (q.v.) in the pursuit of one's own or one's adopted goals.

Bibliography: French, J. W.: The validity of a persistence test. *Psychometrika*, 1948, 13, 271–7. M.A.

Person. The concept of a person might be said to be the starting point of humanistic psychology (q.v.). Etymologists trace "person" back to the Etruscan word *phersu*, meaning a being existing between the world and the underworld. The connection of *persona* (q.v.) with *mask* (Rheinfelder, 1928) also implies humanity, particularly in the sense of body and form; the intellect (or spirit) is also referred to sometimes. In the legal terminology of antiquity, "person" denoted anyone, of any rank, whether freeman or slave.

From ancient times the essential nature of a person was recognized as the unique substance of a nature endowed with reason. In the person-nature relationship there are possibilities of reference to the material and social world and to the realm of the spiritually transcendent. Heidegger asserts that man is fundamentally an active being-in-itself before

which there was possible being-in-the-world. The "person" is conceived as a center of activity in the sense of man as the basic possibility of *personal encounter* (primary dialogue). Man as person is oriented to the community, in which his dignity unfolds to the full.

Drives and associated experiences are the foundation of all human experiences, and include (according to a classification principle derived from the notion of *personal encounter*) those rooted in the *self* (see *Drive*), those rooted in the *ego* (q.v.), and environmentally grounded drives, affects and moods. The concept of a "person" can be only partly or occasionally (as, e.g., in the Jungian sense) identified with the concept of a "self" (q.v.).

Whereas awareness of the *I* (*ego consciousness*, q.v.) is reflective, and represents a higher stage of development, awareness of the self is an existential fact. Not every person is *de facto* "ego-conscious", for man as an embryo or when mentally deranged is also a person. The "person" is the foundation of the process of development and unfolding which is revealed in character (q.v.) and personality (q.v.). Empirical factors and observations (e.g. the need to compensate for feelings of inferiority; conscience, q.v.) demonstrate the existence of a psychic control system within which the personal self has a psychological location. The person-mind relationship is characterized in that the mind enables the person to transcend self, and the person provides the basic moral principle of experience.

Being a person signifies an indivisible, unique and therefore non-replicable unity in human existence. It implies a living entity which embodies a complete whole and does not normally disintegrate during life; and it signifies the individual, living, entire bodily and psychic foundation of man as being (see *Mind-body problem*). Being a person concerns the "vital-biological" level, the "id" level (or *endothymic basis*, q.v.), and is related to the mental or spiritual superstructure, in that (at least) this "intellectual" structure can influence the person inwardly. (See *Strata theory*.)

Recently the personal constitution of human existence has been systematically postulated by that branch of the humanistic psychology movement represented by C. Bühler. "Man as a machine or man as a person?" (A. L. Kovacs) might be thought of as the essential question of the moment.

Bibliography: Arnold, M. B. & Gasson, J. A.: The human person. New York, 1954. Arnold, W.: Person, Charakter, Persönlichkeit. Göttingen, 1970. Bühler, C. & Massarik, F. (Eds.): The course of human life. New York, 1968. Chiang, H. M. & Maslow, A. H. (Eds.): The healthy personality: readings. New York, 1970. Eysenck, H. J.: Psychology is about people. Harmondsworth & New York, 1972. Langon, R. I. & Goodstein, L. D.: Personality assessment. New York, 1971. Lersch, P.: The levels of the mind. In: David, H. P. & Bracken, H. von (Eds.): Perspectives in personality theory. New York, 1957, 212-7. Rheinfelder, H.: Das Wort "Persona". Beih. Zschr. f. roman. Philol., 1928. W. Arnold

Persona. From Latin *persona* = an actor's mask. A term used by C. G. Jung (q.v.) for the "external" character which enables an individual to interrelate with the world around him so that he arrives at a kind of compromise between his individual psychological constitution (individual character) and the collective situation. This presupposes an ability to adapt to society.

Bibliography: Guilford, J. P.: Personality. New York, 1959. J.L.I.

Personal data sheet. A list of questions about S. to be answered in writing by S. In particular, the questionnaire developed by R. S. Woodworth during World War I in order to isolate soldiers with psychological peculiarities, and considered to be the prototype of the present personality inventories. See *Questionnaires*.

H.H.

Personalism. 1. Any idealistic or "existentialist" philosophy or psychology which emphasizes the importance and uniqueness of the human individual. See *Existence analysis*; *Humanistic psychology*; James, William; *Person*; *Personality*.

2. A philosophico-political movement of thought developed and advanced in France by Emmanuel Mounier and put forward by the journal *Esprit*. Personalism offers a realistic psychology of the whole man apprehended in vital situations, while stressing the dynamic interaction of the individual as person (the personal aspect) with the community (the social aspect). "A person is a spiritual being constituted as such by his adhesion to a hierarchy of values, freely adopted, assimilated and lived, by a responsible self-commitment and by a constant conversion; he thus unifies all his activity in liberty and develops, moreover, by means of creative acts, his own unique vocation" (Mounier).

Bibliography: Marcel, G.: *Metaphysical journal*. London, 1952. Mounier, E.: *Traité du caractère*. Paris, 1947. Id.: *Personalism*. London, 1952. *P.M.*

Personality. Man is intensely interested in his own and other people's personalities. The portrayal of personalities and their interactions is the main theme of the literary, dramatic and visual arts. But despite the discussions of human nature by philosophers throughout history, the study of personality was until recently ignored by most psychologists. Partly this was due to its complexity, partly because psychology was more concerned with processes common to all organisms, such as perception and learning, which could be investigated in the laboratory, than with the whole man and his motivation. Therefore the first systematic work was carried out by psychiatrists such as Kraepelin, Janet, Freud and his followers, using clinical and intuitive rather than scientific methods.

Currently we find a welter of different theories of personality, based on different methods and constructs. There is little agreement on the data to be studied, still less on a definition. Allport listed fifty definitions in 1937, and surveys such as Hall and Lindzey's or Wepman and Heine's describe at least fifteen approaches. However, many theorists might accept (though others would reject) the following: personality is the relatively stable

organization of a person's motivational dispositions, arising from the interaction between biological drives and the social and physical environment. The term implies both cognitive and physical attributes, but usually refers chiefly to the affective-conative traits, sentiments, attitudes, complexes and unconscious mechanisms, interests and ideals, which determine man's characteristic or distinctive behavior and thought. Some of the major divergent views are as follows:

1. *Social stimulus value.* Since classical times, personality has often been applied to the impression made on others rather than to the inner self. In lay usage a business director has a forceful, an actress a glamorous, personality. Clearly everyone plays varied roles, and tries to display a personality acceptable to those he meets; even his self-concept may be self-deceptive (Goffman, 1956; Vernon, 1964).

2. *Nomothetic.* Psychometrically inclined authors such as Cattell, Eysenck and Guilford accept the reality of stable personality traits of varying degrees of generality, but point out that they cannot be directly observed; they must be inferred from consistencies in speech and behavior. Their aim, then, is to isolate the main dimensions of personality through factor analysis (q.v.) of correlations between tests. Hence personality is conceived as a person's scores on all the measurable factors or common traits. (In addition Cattell proposes that unique traits and their organization can be quantified by Q or P techniques, that is, factorizing persons or occasions.) Emotional instability or anxiety and extraversion-introversion are widely accepted, but otherwise there is little agreement as to what are the major factors, or how they can be reliably measured.

3. *Idiographic.* German writers such as Dilthey and Spranger, together with most clinical psychologists, stress the need for intuitive understanding of the unique organization of each individual personality, as against measurement of his attributes. This approach is inevitably subjective, and Freudian constructs of unconscious motives are particularly

open to criticism as mythical entities, even if useful in theory-building and in psychotherapy (q.v.) (Meehl, 1954).

4. *Behaviorism* (q.v.). May and Hartshorne's studies of character and other attempts to measure general traits yielded such low correlations between tests of the same trait as to suggest that personality differences consist of specific habits of response to specific situations. This accorded with contemporary S-R learning theories. Followers of Skinner went further by dispensing wholly with inner dispositions or drives, claiming that we should study only what is directly observable and operationally definable (Lundin, 1961). Such views are important as a backing for behavior therapy (q.v.), which treats neurotic symptoms by conditioning procedures, without regard to hypothetical mental causes. Modern cybernetic behaviorism (q.v.), however, is more flexible in allowing for mediating processes or "plans": even the self might be conceived as a super-plan which guides its own reactions by estimating their likely reinforcing consequences (cf. Mischel's account of social learning theory).

5. *Anti-reductionism*. Both Freudians and learning theorists like Dollard and Miller trace back motivation to tension reduction of the biological drives and the effects of early learnings in infancy. Constitutional temperamental differences are also commonly recognized, for instance, by typologists such as Sheldon. Adler (q.v.) was the first to stress positive striving toward the future rather than determination by the past; and Allport (q.v.) argued that new interests and motives can be acquired at any time of life, becoming "functionally autonomous". The notion of the individual as creating his own personality fits in with current emphasis on curiosity and competence as basic motives, with Horney's and Fromm's accent on social influences, and with Rogers' and Maslow's theories of self-actualization as the fundamental principle in personality growth and development.

6. *Organismic and field theories*, such as Lewin's, Goldstein's and Angyal's, attribute

the organism's behavior to its interaction (q.v.) with the surrounding field, rather than to its fixed dispositions. Lewin's pictorial representation of tension systems, valences and barriers in the total "life space" (q.v.) has been influential mainly in social psychology (q.v.). But Murray's theory of "press" has proved useful in conceptualizing environmental factors in personality. (See *Need*.)

7. *Phenomenology* (q.v.) considers personality wholly in terms of the person's perceptions of himself, of other people and his environment. Motivation, learning and adjustment are ascribed to man's need to resolve incongruities in his phenomenal field, and refashion his maladaptive interpretations. This approach, originating with Husserl, was developed by Snygg and Combs, and is implicit both in Rogers' self-theory and Kelly's psychology of personal constructs. Likewise, existentialism (though more a literary and philosophic movement than a personality theory) holds that man is free to strive for meaning and self-realization in a hostile and purposeless universe.

8. *Culture pattern theories*. Anthropologists and sociologists tend to think of personality as the product of the social groups (q.v.) in which people are reared. Thus Malinowski's and Mead's observations of the non-universality of the Oedipus complex (q.v.) and adolescent instability show that different cultures meet man's needs in different ways and lead to different modal organizations. While accepting that personality always develops in a particular social milieu (q.v.), psychologists are still more concerned with variations from the cultural norm.

9. *Current research into personality*. The search for more reliable means of personality assessment in clinical diagnosis and counseling, and in the selection of college students or employees, continues unabated, though with little signs of success. Rather such work reveals the weaknesses and biases of our instruments, whether objective tests or questionnaires, projective devices or interview techniques. Observational studies of children's

behavior and measurements of self-concepts and attitudes are making fruitful contributions to developmental psychology, though these tend to show a disappointing lack of simple causal associations between child-rearing practices or parental attitudes and such personality variables as aggression (q.v.), anxiety or authoritarianism. (See *Child psychology*.)

More carefully controlled work on therapeutic procedures and their effectiveness should help to throw light on the conflicting theories outlined above. Another noticeable trend is the growth of interdisciplinary research, since neurologists, geneticists, multivariate statisticians, and social anthropologists have much to contribute both to clinical and psychometric personality research (cf. Norbeck, *et al.*, 1968). Work on perceptual defenses and cognitive styles, and on the effects of anxiety (q.v.) and other personality variables on learning (q.v.), suggests that the gap between experimental and personality psychologists is at last being bridged.

Bibliography: Allport, G. W.: Pattern and growth in personality. New York, 1961. Cattell, R. B.: The scientific analysis of personality. Harmondsworth, 1965. Dollard, J. & Miller, N. E.: Personality and psychotherapy. New York, 1950. Eysenck, H. J.: The scientific study of personality. London, 1952. Goffman, E.: The presentation of self in everyday life. Soc. Sci. Res. Centre Monogr., 1956, 2. Guilford, J. P.: Personality. New York, 1959. Hall, C. S. & Lindzey, G.: Theories of personality. New York, 1970. Hartshorne, H. & May, M. A.: Studies in the nature of character, Vol. I: Studies in deceit. New York, 1928. Kelly, G. A.: The psychology of personal constructs. New York, 1955. Lundin, R. W.: Personality: an experimental approach. New York, 1961. Meehl, P. E.: Clinical versus statistical prediction. Minneapolis, 1954. Mischel, W.: Personality and assessment. New York, 1968. Murray, H. A.: Explorations in personality: an interdisciplinary appraisal. New York, 1968. Norbeck, E., Price-Williams, D. & McCord, W.: The study of personality: an interdisciplinary appraisal. New York, 1968. Rogers, C. R.: Client-centered therapy. Boston, 1951. Sheldon, W. H. & Stevens, S. S.: The varieties of temperament. New York, 1942. Snygg, D. & Combs, A. W.: Individual behavior. New York, 1949. Vernon, P. E.: Personality assessment: a critical survey. London, 1964. Wepman, J. M. & Heine, R. W.: Concepts of personality. New York, 1963. P. E. Vernon

II. The origins of the concept "personality" are not wholly clear, and definitions vary in emphasis. G. W. Allport conceives personality as the dynamic arrangement in the individual of those psychophysical systems which determine his unique adaptations to his environment. H. Thomae sees personality as the inclusive concept of all events which comprise an individual life history. J. P. Guilford regards an individual's personality as a unique structure of traits. R. Linton views it as the organized structure of psychological processes and states which concern the individual. For H. A. Murray, it is the controlling organ of the body, effecting change from birth to death.

The concept of *character* (q.v.) is, in the widest sense, that of the unique nature or *uniqueness* of a being. Character in the psychological sense is sometimes equated with *personality*. Both are expressions used by (almost) every psychologist today; yet no psychologist can say precisely what they really mean. Nevertheless, the concept of character has emphasized the static element more than that of personality, which has stressed the functional, dynamic, self-evolving and processual aspects. H. Rohrer characterizes the totality of the developed basic psychological disposition (*anlage*, q.v.) as the human *personality*, and the totality of all psychological *anlagen*—developed and undeveloped—as the *character*. According to Rohrer, a man's personality is that which has emerged from his character to date under the influence of his environment. His character comprises everything that (in the psychological sense) he *can* become.

Whereas science has tried to arrange human characters in typologies (see *Type*), research oriented more to the study of personality has emphasized the nature-nurture, innate traits vs. environment polarity. In his twin studies (q.v.), K. G. Gottschaldt would seem to have shown that endothymic personality traits such as affectivity, fundamental mood and vital drive, are more strongly determined by inheritance than is the intellectual superstructure.

On the basis of his twin studies, H. J.

Eysenck would allow considerable significance to heredity in the determination of personality type. The extent and direction of the environmental influence exerted on an individual depends on his genetic inheritance.

Considerable difficulties are encountered in the empirical investigation of the effects of environment on the development of the whole personality, when attempts are made to determine whether a man's personality has changed under the influence of specific environmental events. In the USA, the predominant view is that the human personality is almost wholly changeable and is formed by life history and social influences. In Europe there is more conviction that the fundamental structure of personality is relatively constant.

It can also be said, by and large, that American theoreticians view personality in terms of external behavior, superficial traits, motor components, interhuman relations and modifiability, and investigate mainly the interaction between the individual and the social environment (culture). European psychologists, on the other hand, tend to favor concepts such as profound disposition (see *Depth psychology*; *Person*), determination by constitution (see *Traits*, *Type*), fixed structure, relative independence from society, and relative unchangeability.

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T. Takuma

Personality inventory; personality questionnaire. See *Questionnaires*; *Traits*; *Type*.

Personality research. A branch of psychology dealing with research into personality (q.v.) apart from abilities (q.v.). Sometimes known

as "characterology" or "characterological research" in the German literature. See *Character*; *Differential psychology*; *Traits*; *Type*.

B.H.

Personality tests. A number of methods which do not test potential intelligence and performance, but affectivity, social attitudes, interests, proneness to neuroticism, etc. The first such tests were the questionnaires used with U.S. soldiers in World War I. Buros (1971) distinguishes projective and non-projective methods, and Anastasi projective (q.v.) methods, from questionnaires dealing with interests, attitudes and personality, the last mentioned concept here referring particularly to such dimensions of personality as extraversion-introversion and neuroticism. There are also "objective personality tests". See *Objective tests*; *Psychodiagnostics*; *Questionnaires*.

Bibliography: Anastasi, A.: Psychological Testing. New York, 1961; Buros, O. K.: (Ed.): Tests in print. New York, 1971. Langon, R. I. & Goodstein, L. D.: Personality assessment. New York, 1971.

G.N.

Personality theory. A system of suppositions which represents the frame of reference in explaining or describing the human behavior and experience relevant to some particular definition of personality. Most such personality theories (in contrast to other psychological theories) refer to the whole person.

Bibliography: Hall, C. S. & Lindzey, G.: Theories of personality. New York, 1970. Ruitenbeek, H. M. (Ed.): Varieties of personality theory. New York, 1971.

D.Ba.

Personality traits, constancy of. The degree to which personality traits remain unchanged in individual expression over a period of time. The same subjects take a number of tests demanding the same criteria, and their behavior throughout the tests is analyzed. See *Factor analysis*; *Traits*; *Type*.

K.P.

Personalization. 1. Experience of one's own psychological activity, as contrasted with depersonalization. 2. Caruso used the word more dynamically to denote the ultimate aim

of psychotherapy (q.v.) or even of human life in itself. See *Conscience; Personalism; Religion, psychology of*. J.L.I.

Personal tempo. The preferred speed of an individual in performing motor actions with no set time limit. An important criterion in experimental typology; it was investigated particularly frequently in connection with E. Kretschmer's typology. E.g.: in a test involving free tapping on a board, leptosomes (q.v.) on average showed a higher personal tempo than athletic types and pyknics (q.v.). On the other hand, when greater accuracy was required, athletic types were the slowest. See *Kretschmer, Ernst*. M.A.

Personal unconscious. See *Jung; Unconscious*.

Personification. 1. The attribution of personal or human qualities to. e.g., an abstraction, a natural force (the sun as Helios on the sun chariot), or a concept (wisdom as a woman with a snake and a mirror). **2.** An individual as an especial embodiment or expression of, e.g., a quality. W.Sch.

Personnel management. A general term for the department in an organization responsible for, and the activity of, personnel counseling, motivation, and so on. Such a department is often put in the care of a director of the firm. See *Industrial psychology; Occupational psychology; Vocational guidance*.

Bibliography: Korman, A.: *Industrial and organizational psychology*. New York, 1971. Miner, J. B.: *Personnel psychology*. New York, 1969. Sokolik, S. L.: *The personnel process: line and staff dimensions in managing people at work*. New York, 1970.

G.R.W.M.

Personnel rating. Determining workers' aptitude, performance and patterns of behavior, including motives, needs, availability for certain jobs and possibilities of promotion. If a personnel rating indicates the level of competence, it can then be decided whether further training, retraining or transfer is appropriate. See *Industrial psychology; Vocational guidance*.

G.R.W.M.

Personnel selection. The systematic selection of individuals according to certain criteria, especially with regard to their fitness for certain vocations, positions or activities (see *Vocational guidance*). Such criteria deal almost always with physical or psychological abilities, and usually with scholastic or vocational knowledge and experience, and sometimes personality variables. See *Abilities; Industrial psychology; Occupational psychology; Traits; Type; Motor skills; Practice*. G.R.W.M.

Personnel training. All measures which form part of *vocational training, further training, and retraining*. It is the function of *vocational training* to give a broadly conceived basic training, and to impart the skills and knowledge necessary in order to engage in a qualified vocational activity; to this must be added the vocational experience required by labor legislation. G.R.W.M.

Perspective. In perception (q.v.) theory "perspective" is one of those factors by which an impression of depth is produced in vision, and more specifically in monocular vision. The effect of differences in size of the retinal images of several positions of one and the same object is related to the depth at which the objects are seen especially when they, or their distances and positions, are arranged with a certain regularity, i.e., in changing size or density. Hence the retina registers as more distant those objects which appear smaller and areas which appear denser, an important factor in this connection being aerial perspective (blurring due to haze). In special cases one can recognize receding lines converging in depth. See *Identical (retinal) points*.

Bibliography: Gibson, J. J.: *The perception of the visual world*. Cambridge, Mass., 1950. E.R.

Persuasion; persuasion therapy. A method in psychotherapy (q.v.) put forward by P. Dubois as an alternative to suggestion (q.v.): an attempt is made to influence the patient by

rational means, i.e. through the use of argument. The object is to secure a "reasonable judgment" of the illness; judgment (q.v.), as Dubois asserts, is influenced by concomitant emotional influences, which he allows only a secondary importance. Related to persuasion therapy is logotherapy (q.v.), although the latter uses psychoanalytical techniques. See *Depth psychology; Emotion.* W.Sch.

Perversion. Behavior, especially compulsive sexual behavior, which is subject to social condemnation. Behaviors frequently included are: bestiality (q.v.), exhibitionism (q.v.), fetishism (q.v.), homosexuality (q.v.), sadism (q.v.), masochism (q.v.), sodomy (q.v.), and even masturbation (q.v.). Rape, incest (q.v.) and promiscuity may be excluded. Hence the term perversion carries implications of abnormal sexual behavior in the sense accepted in Western culture, and has corresponding emotional overtones. With increasing awareness of the variety of human sexual behavior, the term is likely to diminish in significance, except, possibly, as an unfortunate term of abuse.

In psychoanalytic theory it is postulated that the child shows perversions or is a "polymorphous perverser". That is to say, since the child's sexual instincts have no normal outlet, they lead to various behaviors which would be called perversions in the adult. However, this only develops to actual perversion in adulthood by fixation of personality and sexual development at an early developmental stage. Fixation is said to produce perversions and neuroses. Perversions can remain in the background of normal sexual development but then will be continually detrimental to normal sexual energy or libido.

A. Broadhurst

Petit mal. A very varied group of cerebral attacks occurring during pre-school and school age (four to fourteen years). The most frequent forms are: (a) *Propulsive petit mal* occurring in the first three years of life. During the seizure (which lasts a few seconds) there is a

jerking forward movement of the head, sometimes accompanied by bending of the trunk and crossing of the arms; at the same time there is restriction of consciousness. This usually occurs in series, so that it is often confused with grand mal seizures. EEG records a diffuse mixed convulsion potential. Etiology: brain damage in early childhood. (b) *Myoclonic-astatic seizures*, occurring at the age of four years. Due to sudden loss of muscle tone children collapse as if struck by lightning. The seizure is often accompanied by twitching of the arms and the facial muscles. The EEG resembles that for propulsive petit mal. (c) *Pyknolepsy*: repeated "blank spells", often several hundred in one day. (d) *Petit-mal status*: Attacks of mental dulness which can last without interruption for hours or days. (e) *Impulsive petit mal* (myoclonic petit mal): patients aged between fourteen and seventeen; lightning-like jerking of the trunk and arms which lasts two to three seconds. The children are dazed for one to two seconds only with the more violent jerks. See *Absence; Grand mal.*

Bibliography: Sargant, W. & Slater, E.: Physical methods of treatment in psychiatry. London, 1963. Scott, D. F.: About epilepsy. London, 1969. C.Sch.

Petting. Like dating (q.v.) and necking (q.v.) a part or phase of heterosexual relations. Petting includes kissing and caressing the breasts, manual-genital contact, oral-genital (q.v.) contact apposition of sex organs without penetration and coitus (q.v.), and mutual masturbation, usually to orgasm. Petting in extra-marital sexual relations is an accepted substitute for intercourse (especially in the USA).

Bibliography: Ehrmann, W.: Premarital dating behavior. New York, 1959. J.Fr.

Pfahler types. A typology whose elements were described by Pfahler (1932) as "inherited basic functions", including *crystallized* or *fluid apperception*, or *attention* (q.v.) (restricted-broad, fixed-wandering), *tenacity of experience* (strong-weak), *emotionality* (sad-cheerful), and *vital energy* (strong-weak). Main types (out of twelve obtained by combining

the above dimensions): (a) type with a *stable inner constitution*: receptive to a narrowly limited range of environmental influences, which are then stubbornly retained; loyalty and steadfastness of emotivity and purpose, thoroughness (perseveration). Corresponds to Kretschmer's introverted, schizothymic type. (b) Type with a *mobile inner constitution*: wide-ranging attention, old quickly obliterated by new impressions, emotions unstable, insufficient perseverance in purpose and little thoroughness of action. Corresponds to Kretschmer's extraverted, cyclothymic type. These main types can be subdivided according to gradations of emotion and vital energy. See *Traits; Type*.

Bibliography: Pfahler, G.: *Vererbung als Schicksal*. Leipzig, 1932. Id.: *System des Typenlehren*. Leipzig, 1936. W.K.

PGR. Abb. for *psychogalvanic reflex*. See *Skin resistance*.

Phallic cult. The cult (q.v.) of the penis continues in India and some other countries; it was very prevalent in antiquity and among primitive peoples (Egypt, Asia Minor, Greece and Italy). The phallus (q.v.) is venerated as a symbol of procreative power; opposition to such cults formed part of Jewish and Christian sexual morality. W.Sch.

Phallic stage (syn. *Phallic phase*). According to Freud, the beginning of the early genital or Oedipal stage (q.v.). Exhibition of the masculinity just discovered by the boy (and to a lesser extent of her femininity by the girl), boasting and a desire to impress are more noticeable than interest in the parent of the opposite sex or other such persons in the family. See *Genital stage*. W.T.

Phallography. A method for measuring the erection of the penis; used especially in behavior therapy (q.v.) of certain sexual deviations as a measure of success and to objectify a decision to use reinforcement.

Phallography is effected telemetrically by means of a sleeve which registers the changes in penis volume. U.H.S.

Phallus. Originally a representation or sculptured image of the penis (or penis and testes), particularly as used as a decoration, object of veneration, or symbol of fertility and creativity in certain ancient Greek (e.g. Dionysian) and Asian cults. In psychoanalysis (q.v.), the penis itself is called a phallus, particularly during the stage of infantile sexuality when it is associated with "narcissistic love". There is an increasing tendency, both in psychoanalysis and elsewhere, to use the term as synonymous with "penis", perhaps partly as a result of euphemistic processes. G.D.W.

Phantom limb; phantom pain. When a limb has been amputated, the nerves that originally emanated from it will remain from the stump to the CNS. Any activity occurring in these nerves will be experienced as arising in a phantom limb from where the receptors originally associated with the nerves were. Thus various sensations of movement and pressure apparently localized in the non-existent limb may be felt and in particular pain, which, since it is localized in the non-existent limb, is called *phantom pain*. C.D.F.

Pharmacology. A part-discipline of medicine which deals with the effects of synthetic and natural chemical substances on animal and human organisms. The part-area of pharmacology concerned with the effects of psychopharmaceutical agents is important for psychology. See *Psychopharmacology*.

Bibliography: Goodman, L. S. & Gilman, A.: *The pharmacological basis of therapeutics*. New York, 1965. Kuschinsky, G. & Lullmann, H.: *Kurzes Lehrbild der Pharmakologie*. Stuttgart, 1970. Moller, K. O.: *Pharmakologie*. Basle, 1966. W.J.

Pharmacopsychiatry. A part-area of psychiatry which deals particularly with the study

of the effects of psychotropic substances, especially psychopharmaceutical agents, on morbid conditions and behavior, as well as with the morbid (abnormal) changes in condition and behavior caused by drugs. There are no fixed boundaries with psychopharmacology (q.v.).

W.J.

Pharmacopsychology. See *Psychopharmacology*.

Pharmacopsychopathology. A part-area of psychiatry (q.v.) which deals with abnormal or morbid changes brought about by drugs.

Bibliography: De Boor, W.: *Pharmacopsychologie und Psychopathologie*. Berlin, 1956.

W.J.

Pharmacotherapy (a more accurate term is *psychiatric pharmacotherapy*) is the treatment of psychic (i.e. psychological, or mental) diseases belonging mainly to the group of endogenous *psychoses* (q.v.) and *neuroses* (q.v.), with the aid of psychopharmaceutical agents. Pharmacotherapy is usually regarded as an alternative to electroconvulsive therapy (ECT) or to psychotherapy (q.v.) and behavior therapy (q.v.), although the different methods are not mutually exclusive (Gottschalk, 1968; May, 1968). Pharmacotherapy came into use on a large scale in about 1952, and it is now widespread for the treatment of endogenous psychoses. It could be shown in a large number of cases that pharmacotherapy either gave better therapeutic results or, with the same results, left more room for maneuver in designing a therapy for a psychosis (e.g. ambulant treatment) than did the formerly prevalent ECT, or similar methods (Davis *et al.*, 1968; Hippus, 1961). If one starts from biochemical conditions of endogenous psychoses, pathogenetic part mechanisms (Hippus, 1968) are influenced by pharmacotherapy; this accords with drug therapy in other fields of medicine. Of course, pharmacotherapy does not, as a rule, produce a final cure (Kamano, 1966) but gives periods free from symptoms or shortens the phases of illness.

Pharmacotherapy in neuroses, especially with tranquilizers (q.v.), has as yet only a supportive function in regard to other techniques, particularly in reducing anxiety or tension (Rickels, 1968). Of course, the enduring effect of psychopharmaceuticals in the treatment of psychoses must be seen not only in a biochemical change in the organism but as derivable in part from learning processes induced by the drugs (Honigfeld, 1964). A crucial problem in optimizing pharmacotherapy is to obtain exact indications and details of the effects; the target symptoms are of primary importance here (Freyhan, 1959): nevertheless, it is not possible to dispense with crude nosological classifications and differentiations according to personality traits, biographical or demographic characteristics within groups with comparable target symptoms (Wittenborn & May, 1966). Determining the results of pharmacotherapy presupposes that target symptoms are definable, operationalizable and can be weighed one against the other. Clinical tests of psychopharmaceuticals are limited by the obligation of optimal treatment (e.g. a placebo test replaced in large measure by examination against a standard preparation) and by shortcomings in the secret experimental control test: a barrier to carrying out a double blind experiment because of the variation of drugs by reason of side effects (Heimann, 1969).

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